VOL. XXX. No. 12 DECEMBER 1945

MECCANO MAGAZINE

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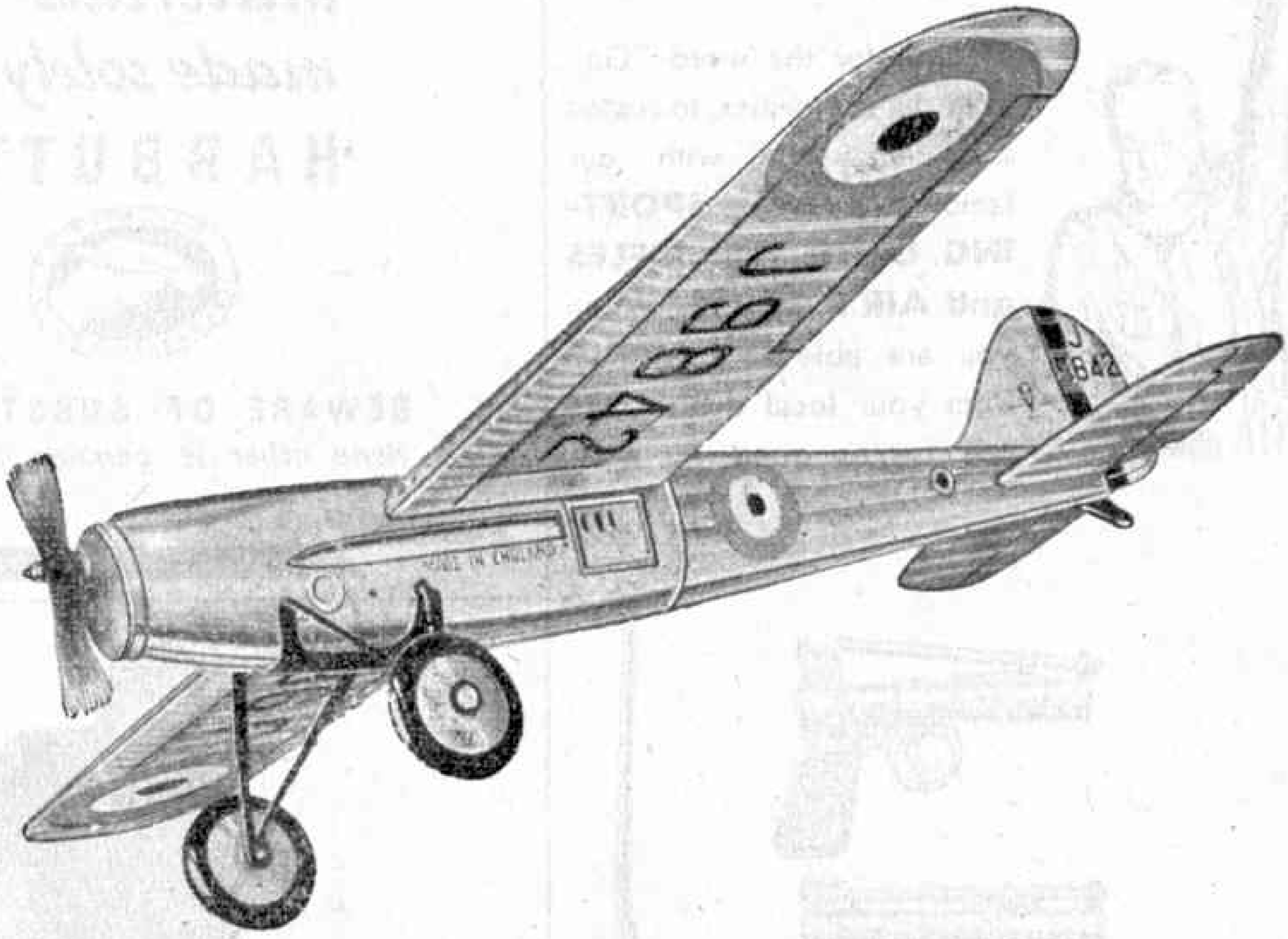

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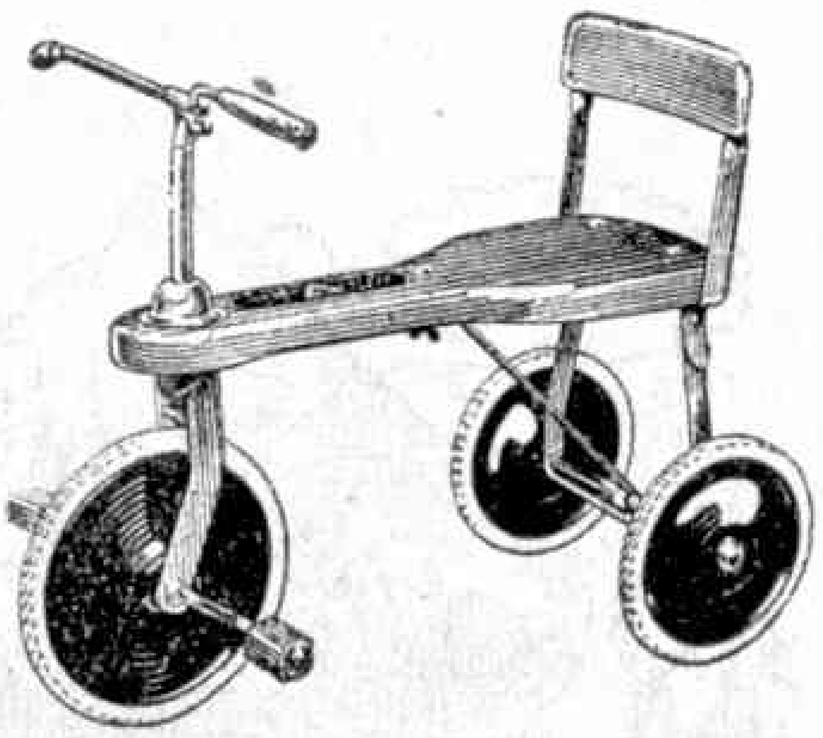

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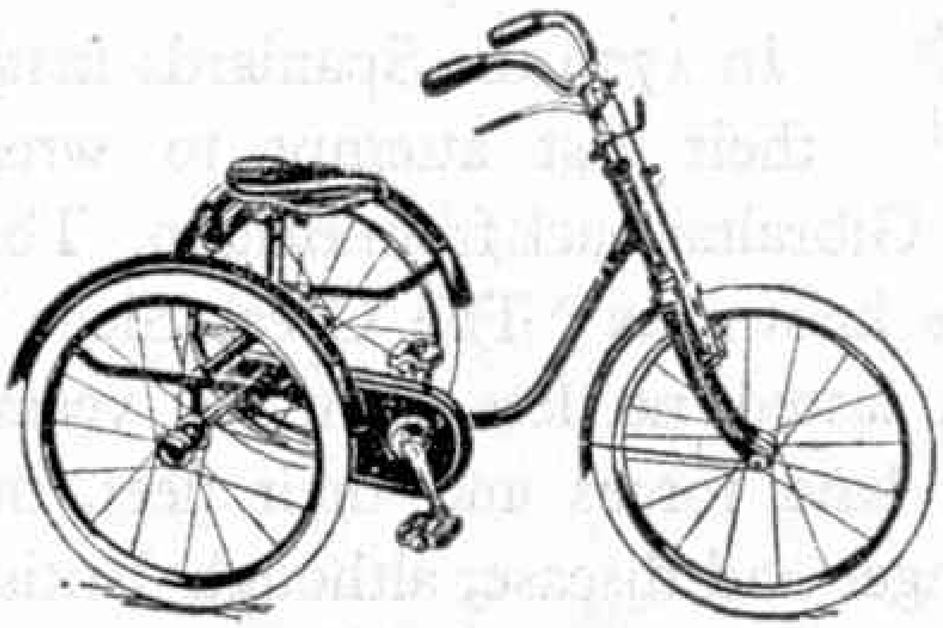
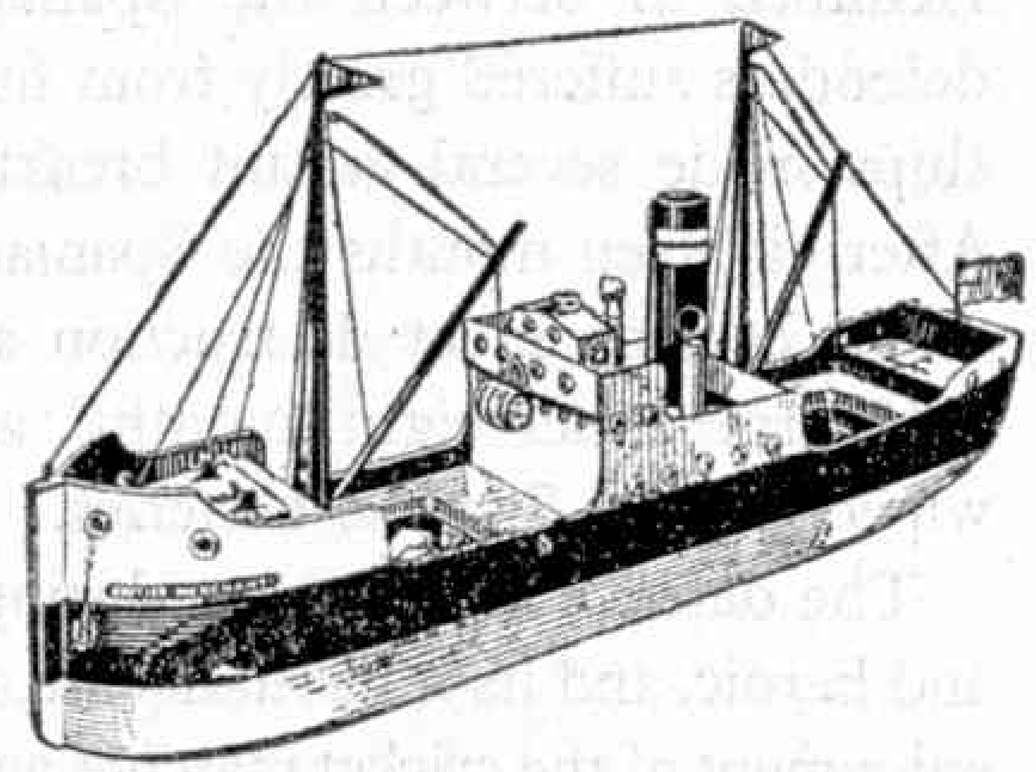


UNTIL THE PRESENT PRICE CEILING IS REMOVED, MANY FINE TOYS CAN ONLY BE MADE FOR EXPORT.



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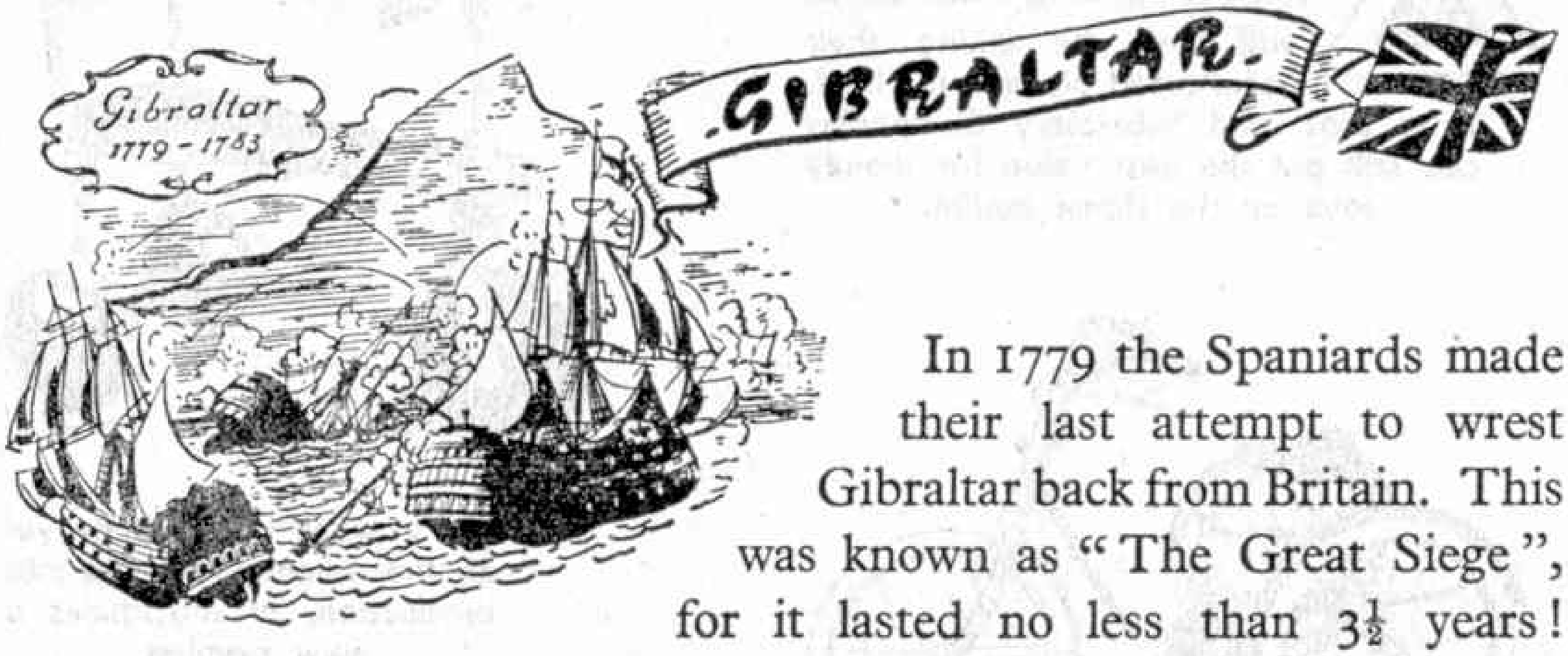

In 1779 the Spaniards made their last attempt to wrest Gibraltar back from Britain. This was known as "The Great Siege", for it lasted no less than 3½ years! Hemmed in between the Spanish land forces and their fleet, the defenders suffered greatly from hunger and disease, although British ships made several gallant breakthroughs to get supplies to them. After eighteen months the Spaniards opened a fierce land bombardment, causing great destruction and loss of life; but the garrison held firm under eight months' almost continuous fire, and finally wiped out the Spanish batteries.

The defence of Gibraltar during this war was no less determined and heroic, and its inhabitants are again looking forward to well-earned enjoyment of the cricket matches and cycle rides which were so popular. Keen cyclists are longing, like you, for the day when they can have a new B.S.A. Supplies will soon be coming through—so keep in touch with your dealer!

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MECCANO MAGAZINE

Editorial Office:
Binns Road
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Vol. XXX
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December 1945

With the Editor

A Little More Paper

The recent welcome release of additional paper has enabled me to print more copies of the *"M.M."* and at the same time to make a small increase in the number of pages in each issue. This means that my waiting list of would-be subscribers can now be shortened a little, but unfortunately the supply will still be far from meeting the demand. I must therefore renew my appeal to readers to share their copies with friends until the happy day arrives when I can print enough to go round.

Wartime Science and Engineering

Since the end of the war with Germany it has been possible to reveal some of the amazing triumphs of science and engineering that played such a vital part in securing victory. Some of these achievements have been entirely British, and in the remainder British brains and technical skill have had an important share.

One of the most remarkable successes was the transmission of millions of gallons of petrol across the Channel by means of submarine pipe-lines. The system was known as *"Pluto"* meaning *"Pipe-Line Under the Ocean,"* and it may be described as a pipe-line resembling a submarine electric power cable without cores or insulation. The pipe was 3 inches in diameter. Short sections of it were welded together into enormous lengths, and wound on to huge drums much as cotton is wound on to a reel. *"Pluto"* made it possible to supply our advancing armies with the vast quantities of petrol they needed as they swept forward into Germany.

"Fido," a word originally derived from *"Fog Investigation Dispersal Operation,"* was a development that solved the problem of dispersing fog over airfields by means of rings of flames. It enabled aircraft to carry out offensive operations, and to land, in conditions of fog that otherwise would have led to serious loss of lives and machines or to the stoppage of flying altogether.

There were many other brilliant wartime inventions and developments, with which there is not space to deal here. The most gratifying feature of them all is that they showed that British brains and technical skill were equal or superior to the best that Germany could produce. If this splendid material is rightly used it will enable Britain and the British Commonwealth to overcome the ravages of war and restore prosperity on a firm foundation.

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The Most Famous Clock in the World

By T. R. Robinson, M.B.H.I.

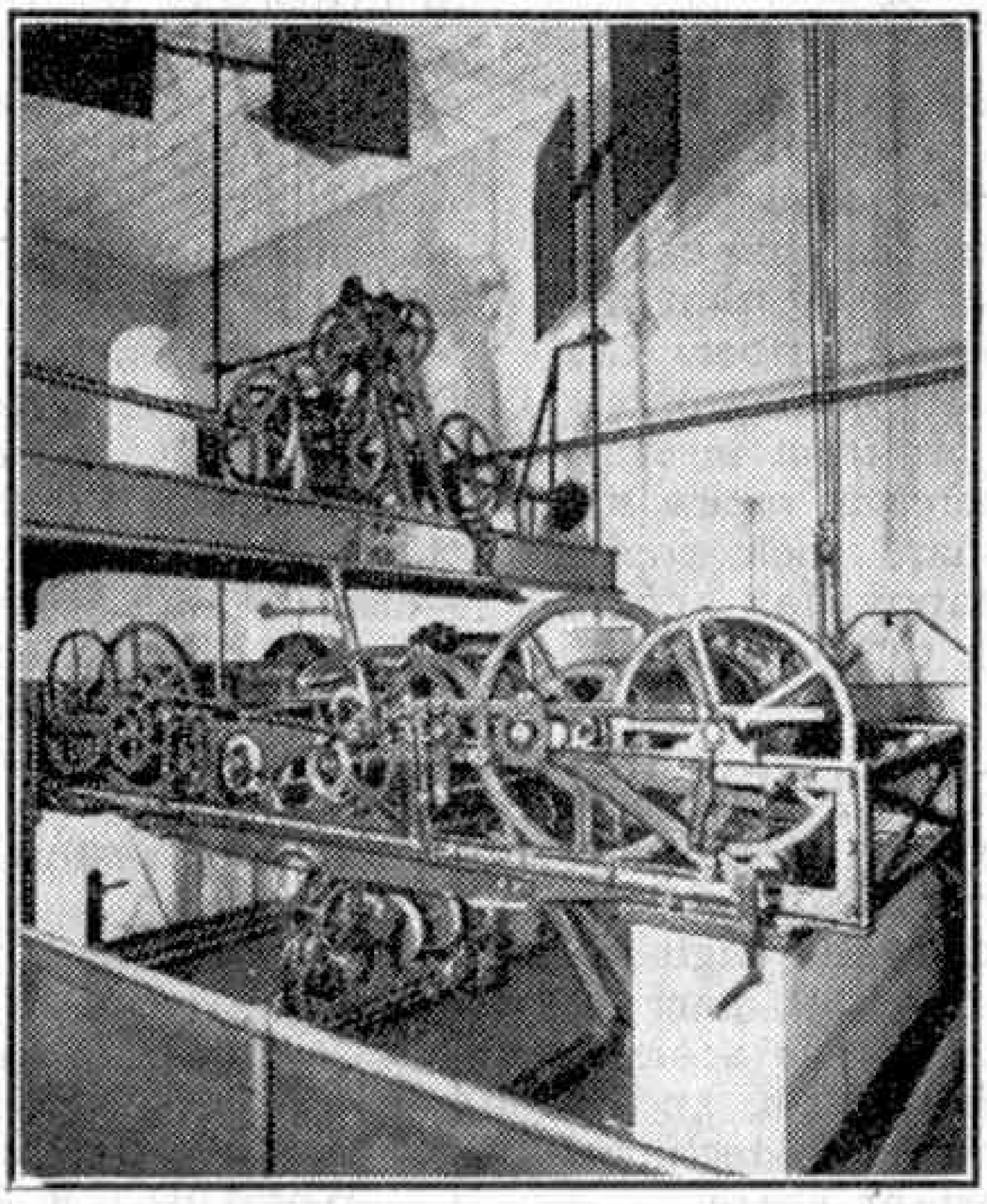
THE great timekeeper that strikes on "*Big Ben*" in the Houses of Parliament, London, is the most famous in the world. The mighty clock-tower, with its four 23-foot dials, seen on our cover, has become such a real symbol of the capital city of the British Commonwealth of Nations that it is known in every land. Through B.B.C. broadcasts of the sound of its chimes and striking it has become nearly as familiar to millions of people all over the Earth as to Londoners, and on many great occasions, both grave and gay, the sound of the bells has brought together all those living under the British flag in a way that few other things could do.

Apart from this, the great clock is notable in many ways. It is still the largest, most accurate, and most powerful mechanical clock in the world, and it has never been really challenged by any of the large weight-driven clocks that have been erected since it was set going in 1859. Its construction was a remarkable feat of engineering. Nothing quite like it had ever been made before, and when it was first proposed even clockmakers doubted if such a huge machine could be made to keep accurate time, for most of the ordinary church clocks made during this period were not very reliable as timekeepers.

After much discussion, the making of the clock was entrusted to Frederick Dent, the designs being produced by Edmund Beckett Denison, afterwards Lord Grimthorpe, a lawyer who had become well known for his improvements to turret clocks. Both Denison and Dent were faced with considerable opposition, and several years elapsed between the making of the clock and its erection in the tower. Muddles and misunderstandings also interfered with the work, and many queer things occurred. The hands of the clock provided one instance. Although Denison designed the mechanism, Sir C. Barry, the architect of the Houses of Parliament, decided to be responsible for the dials and hands. The hands he designed were so massive that the clock could not be made to drive them, so that they had to be scrapped, and replaced by properly constructed hands of Denison's design.

There was trouble over the bells too, particularly over the great 13½-ton hour bell, which came to be nicknamed "*Big Ben*," after Sir Benjamin Hall, First Commissioner of Works at the time. As with the hands, the design eventually had to be entrusted to Denison, but even then the bell was not a success. Apparently no one knew enough to make a good job of casting such a big bell. The first one produced turned out to be porous and it cracked soon after being hung at Westminster. It was then taken down and sent to be re-cast at another foundry. Later it cracked again, but as this did not seem to affect its note seriously, it was left, and the sound that we now hear comes from this bell.

When at last the troubles were overcome, and the clock was set going, it kept such excellent time that even those who had opposed its construction were forced to admit its success. The general design of the clock, and the "gravity" escapement fitted to it, proved so good that they have since become standard practice and have done much to gain for British turret clocks their reputation of being the best in the world.



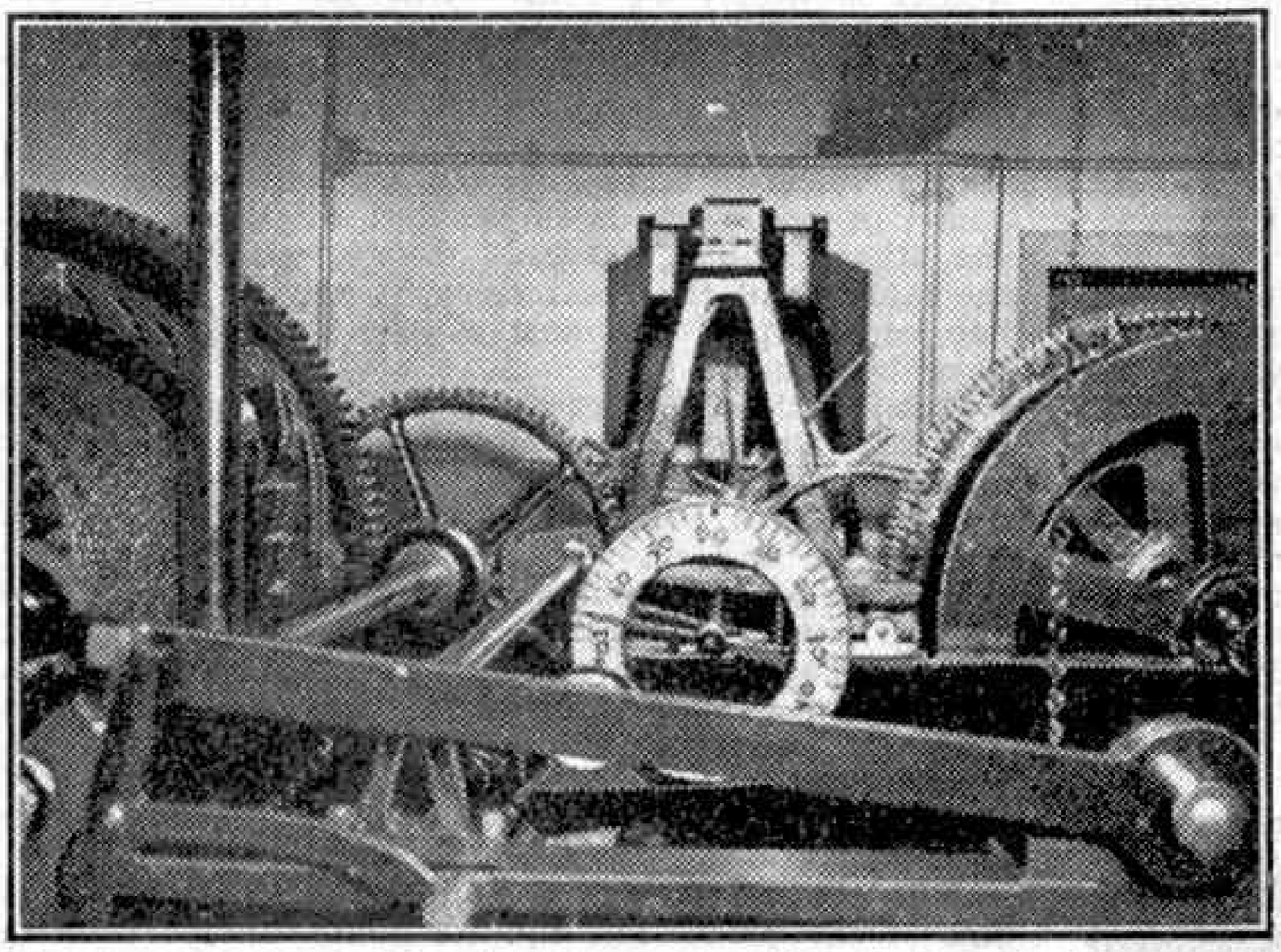
Mechanism of the great clock seen from the chiming train end, showing the bevel wheels driving the shafts to the hands. The air brakes are seen at the top of the illustration; they control the speed of chiming and striking. Photograph by courtesy of the "Horological Journal."

The great clock is now 87 years old, and its perfect condition and splendid timekeeping show how soundly designed and made it was. Even though it is so familiar, this king of clocks still remains impressive and dignified. A visit to the mighty mechanism is an event for which special permission is necessary, and even then the long climb up the steep spiral stairway of 292 steps is a breath-taking business.

At the top, beyond a massive oak door, is the clock-room, spacious and spotlessly clean. Beside one of the walls rise the tops of two specially built supporting walls, and resting upon and spanning these is the main frame of the huge mechanism, placed to one side of the room so that its 13-foot pendulum can hang from a mighty cast-iron bracket built into the clock room wall. The great size of the clock is at once apparent, but despite this, the first impression gained is one not of bulk or strength, but of accuracy and precise design.

The main frame consists of cast iron members of the girder type, bolted together to make up a rectangular structure shaped rather like a shallow box. Additional cross members, positioned between the various groups of wheels, unite and strengthen the long side castings and reinforce the assembly, and still another short frame spans these cross members and carries some of the bearings of the wheels of the timekeeping part of the clock. Housed in these frames are the three sections of the clock mechanism, one to measure time and drive the hands on the dials, another to sound the quarter hours, and a third to strike the hours on "*Big Ben*." All these three trains of wheels are driven by weights, which hang from steel-wire ropes, and the clock is wound by coiling these ropes around great drums, or "barrels," which are mounted on the spindles of the main wheels and coupled to them by sturdy ratchets and pawls.

The timekeeping mechanism is the first to claim



The escapement and timekeeping part of the clock, with the seconds dial. Photograph by courtesy of the "Horological Journal."

attention. It is located in the centre of the frames, and most of the spindles of its wheels are much shorter than those of the chiming and striking trains, for their bearings are mounted upon the short additional frame mentioned earlier. As the timekeeping of the clock is so accurate, a special additional mechanism, called a "maintaining power," is fitted to the barrel and main-wheel to keep the wheelwork going while the weight is being wound up. Its action is most ingenious, for as soon as winding begins it comes into operation automatically, and continues to drive the timekeeping part until winding is completed.

Special small dials, with hands attached to the spindles of various wheels, indicate hours, minutes, and seconds, and the seconds dial is interesting, for it is marked off in two-second divisions. The reason for this is that the great pendulum takes two seconds to complete each swing, and so smaller divisions of the dial would be useless.

The escapement, the heart of the whole clock, is the most interesting thing of all, for it is the famous "double three-legged gravity" invented for the Westminster clock, and is the real secret of its precise timekeeping in all conditions of wind and climate. In ordinary clocks, the escape-wheel keeps the pendulum swinging by transmitting part of the driving power of the wheelwork to the pallets in a series of impulses. As large clocks have exposed hands, wind pressures can vary the force of these impulses, and so, by interfering with the swing of the pendulum, cause errors in timekeeping. The great hands of the Westminster clock are particularly liable to heavy wind pressures, and so it was necessary to adopt some principle that would overcome the defect.

After some experiment, the present escapement was devised. In it the pallets are replaced by two weighted arms, which are raised in turn by the escape wheel, and allowed to fall on the pendulum as it swings. As the weight of the arms is always the same, the impulses they give remain constant, however much wind and weather buffet the hands and vary the power transmitted by the wheelwork.

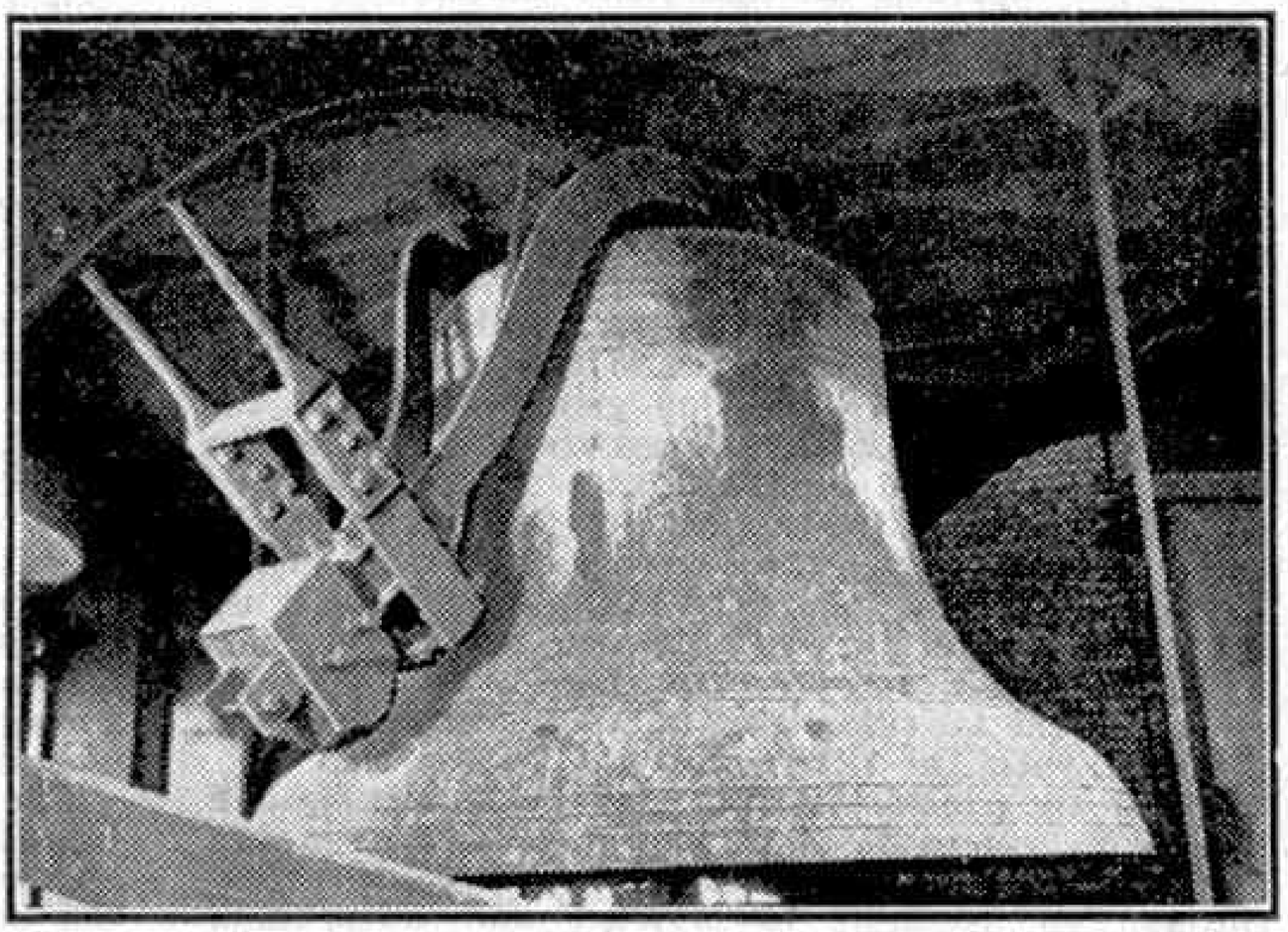
The action of this wonderful escapement is fascinating to watch. The escape-wheel can be seen raising the arms as it moves round, step-by-step, and the descent of the arms, as they deliver their impulse, shows what a tiny amount of energy is necessary to keep the great pendulum, with its 4 cwt. bob, swinging steadily. As the escape-wheel rotates a sixth of a turn each time it moves a fan, or "fly," is fitted to its spindle, to act as an air brake, and prevent the wheel from jumping forward too rapidly as it is released.

Only the upper part of the pendulum rod is visible, for most of it is below floor level, but the top portion of the zinc and iron tubes, which compensate it for changes of temperature, can be seen. Just above them is a small circular platform, on which lie the weights used to give the final adjustment of regulation. Some of these are coins, such as pennies and half-pennies, which form very convenient weights for the purpose.

At several points on the timekeeping part of the clock are pairs of contact springs, and by means of these the clock closes an electrical circuit and automatically telegraphs its time twice a day to Greenwich Observatory, where a record of its performance is kept. There is no synchronisation of the great timekeeper from any other controlling master clock, and indeed its timekeeping is so good that any such supervision is quite unnecessary.

The quarter-chiming mechanism, which is on the right-hand side of the movement, is far more massive than the timekeeping part. The main-wheel and barrel bring to mind the gear wheel and drum of a great crane, and the other wheels and pinions are in proportion. The barrel, the circumference of which is spirally grooved to guide the weight line, is almost as wide as the frame; and several pawls, spaced around the rim of the main-wheel, engage with the ratchet wheel in order to distribute the load and ensure safety of action. In order to get the utmost power, the steel-faced cams that operate the hammer levers and raise the hammers of the quarter-bells are mounted on a large drum directly attached to the main wheel. The speed of chiming is governed by a large fan, or "fly," mounted on a large vertical spindle, and driven from the wheelwork through bevel gears; and the control of the mechanism, which ensures that it sounds the correct number of notes at each quarter-hour, is achieved by a notched wheel called a "locking-plate," which locks the wheel-train as soon as a blade, mounted on a lever, falls into one of the notches.

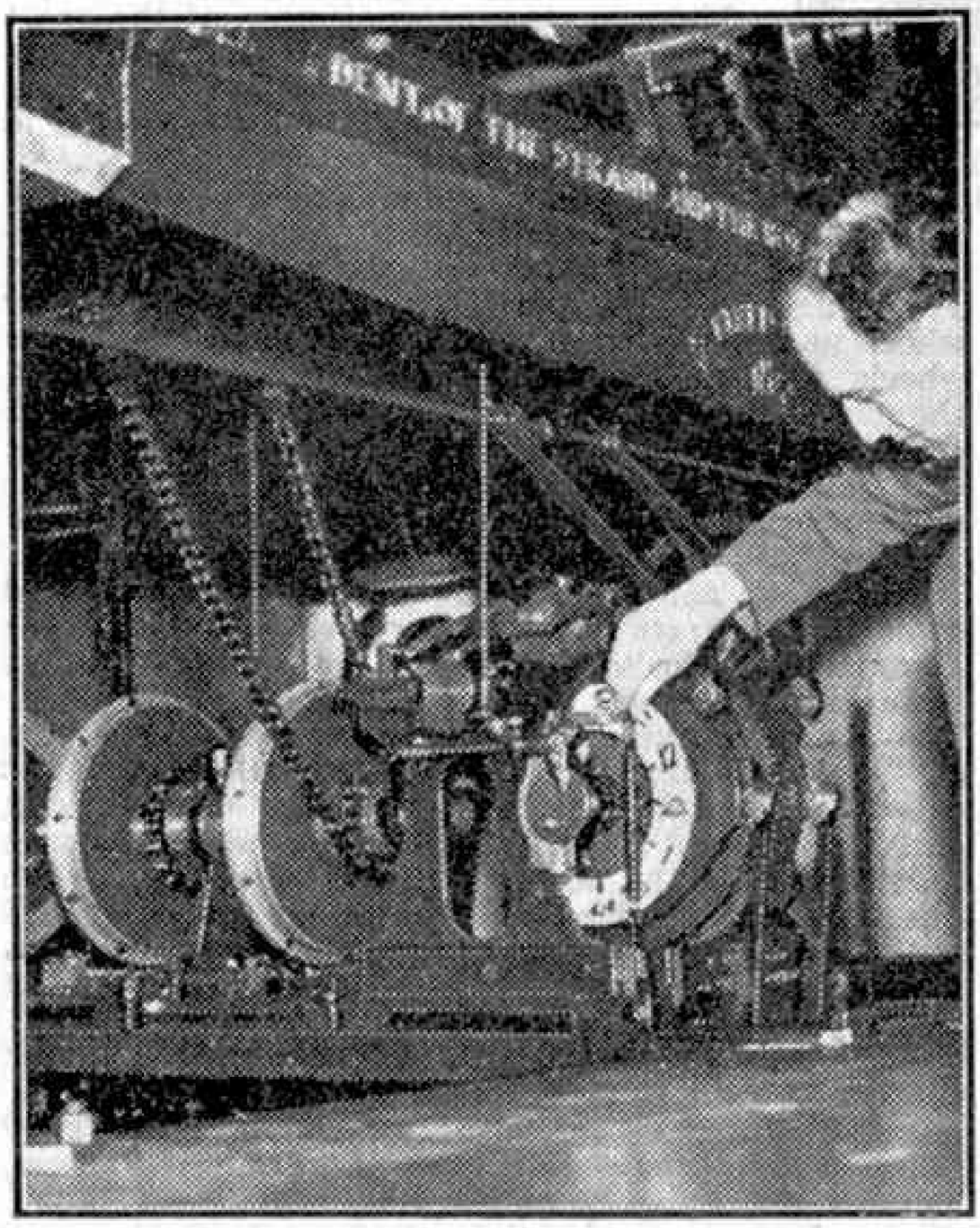
The striking mechanism is at the opposite end of the frame, and is very similar to the chiming part, but its main wheel carries only a single ring of huge cams, which engage with the great hammer lever, and lift the 4 cwt. hammer that sounds the hours. The steel-wire rope that links the lever to the hammer



"Big Ben" himself, the great 13½ ton bell.

is half an inch in diameter, and the buffer spring that steadies the hammer-lever is a bar of steel, so thick that it does not look like a spring at all. The striking of the correct number of blows at each hour is controlled by another locking-plate, similar to that of the chiming train, but notched to provide for the striking of one more blow at each successive hour from one up to twelve.

The first blow on "*Big Ben*" at each hour is designed to indicate the exact time, and to make certain that the striking mechanism is released at precisely the right instant it is not sufficient to let it off from the spindle, which is rotated once each hour by the timekeeping part. At Westminster the hour spindle is arranged to unlock the striking mechanism just before the right time, and "hand over" the final release to a special extra cam, which rotates once in every 15 min. As this cam turns more rapidly it can unlock the striking far more precisely, and so the great hammer is dropped at just the correct moment.



The electrially driven winding mechanism, which operates through roller chains.

The shafts and bevel gears that link the time-keeping train to the hands of the four huge dials are fine pieces of work. The bevel wheels would dwarf the rear axle gears of a large motor vehicle, and the main group of wheels, located just above the clock mechanism, is mounted on two large girders, which span the clock room. Close against the clock room walls, at the points where the hand shafts pass through, are three of the great "motion-works," the 12-to-1 reduction gears that drive the hour hands. These in themselves are hefty assemblies of gearing, and the counterbalance weights mounted on the spindles give some idea of the weight of the hands they balance. The fourth motion-work is not in the clock-room, for a ventilating duct is built up the tower behind the wall through which the shaft passes, and the motion-work accordingly had to be placed on the far side of the duct. Its construction is identical with the other three.

When the clock was first put up it was wound by hand, a process that took several hours each week. An electric motor now does the work, acting through an assembly of clutches and roller-chain drives. The weights need some winding, for their total weight is nearly 2½ tons. Although not used, the hand winding attachments are still left in position.

The mounting of all the clock mechanism on a long horizontal frame makes any adjustment or maintenance fairly easy; as almost all the bearings are in blocks attached to the frames, nearly every part can be taken down without disturbing any of the others. This "flat-bed" design, which is one of the features of the great clock, is another thing that has been copied on most of the large clocks that have been made since.

Outside the clock room are four passages, which pass around the tower behind the great dials. One side of the passages is formed by the skeleton frame-works, filled in with opal glass, which form the huge dial-plates, and on the other sides are vast walls, painted white, on which are mounted the powerful electric lamps used for illuminating the dials at night. Spanning the spaces between the walls and dial centres are great brackets, bearing the spindles and tubes that carry the hour and minute hands. Rollers are mounted on these brackets, to carry the weight of the spindles and hands and to reduce friction.

It is not easy to give a good idea of the tremendous size of the dials. The minute hands are 14 ft. long and weigh about 2 cwt. each, and the hour hands, measuring some 9 ft. in length, weigh 6 cwt. each. The great Roman numerals are 2 ft. high, and the minute spaces are 1 ft. square. If these measure-ments are compared with those of similar markings on the dial of an ordinary clock, some impression of the relative sizes will be obtained. It is worth mentioning that the Westminster clock is a little unusual in its dial markings. The fourth numeral is "IV," instead of the more common "IIII." It would be interesting to know how many people have seen its dial, day after day, for years, without noticing this little difference!

Above the clock room and dials is the belfry, with "*Big Ben*" in the centre, surrounded by the four quarter bells. All hang from an immensely strong and massive girder framework, which is so big that even the 13½-ton giant in the centre does not, at first, look as big as he really is. A closer inspection soon gives a more correct idea of his size, and of the dimensions of the hammer and buffering blocks which arouse his mighty voice to proclaim the hours. By looking carefully the crack in his side can be found, but it is not very obvious. The quarter bells seem small in contrast with "*Big Ben*," but they are quite big enough in their way. The largest weighs 3 tons 18 cwt., which would be a big tenor bell for any ordinary peal in a church tower. Even so, the sound of the chimes and striking is not deafening up in the tower. Perhaps this is because the belfry is so open that the sound can get away on all sides. In a corner of the belfry is a small object that takes the sound farther away still—the B.B.C. microphone, by which the world hears the clock. It is such a small and insignificant instrument that it is difficult to realise that it is the "ears" of many million people.

Although the quarter chimes at Westminster have become so well known in connection with the clock that they are often called the "Westminster" chimes, that is not their real title. Actually they are the "Cambridge" chimes, and were first composed for Great St. Mary's Church, Cambridge, being an adaptation of a phrase from Handel's "*I Know That My Redeemer Liveth.*" They were so successful that they were selected for the Westminster clock, and they soon became so famous there that their original title was forgotten by many people. They are still the finest set of quarters for four bells, and have become so popular since the Westminster clock started to use them that they can now be heard from thousands of clocks, big and small, in every land.

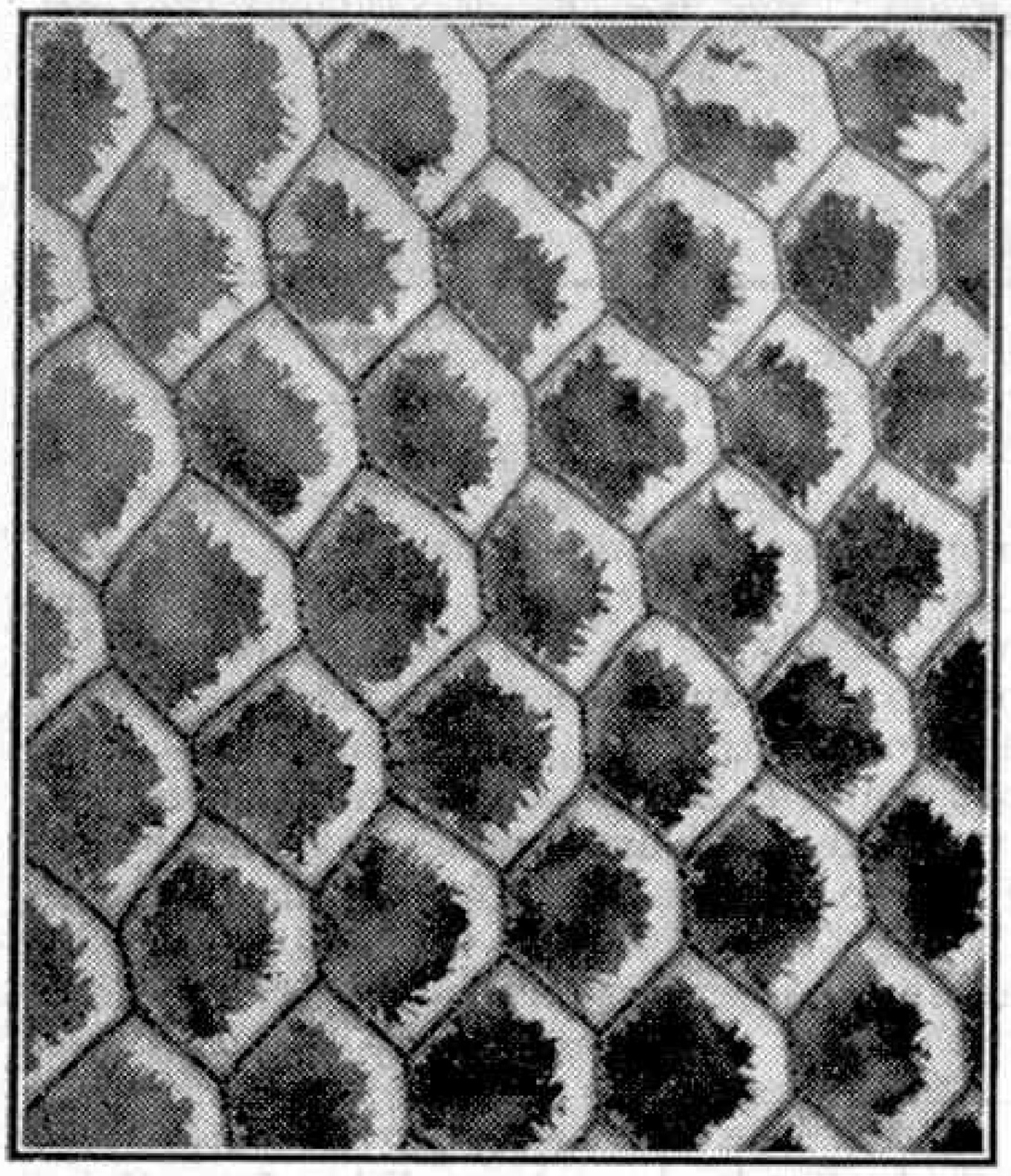
The Westminster clock is still looked after by the firm of Dent. Many other clocks have made their appearance since the day when it was first started, but none can claim an equal fame or such a wide-flung public.

Photography

Some Christmas Pictures

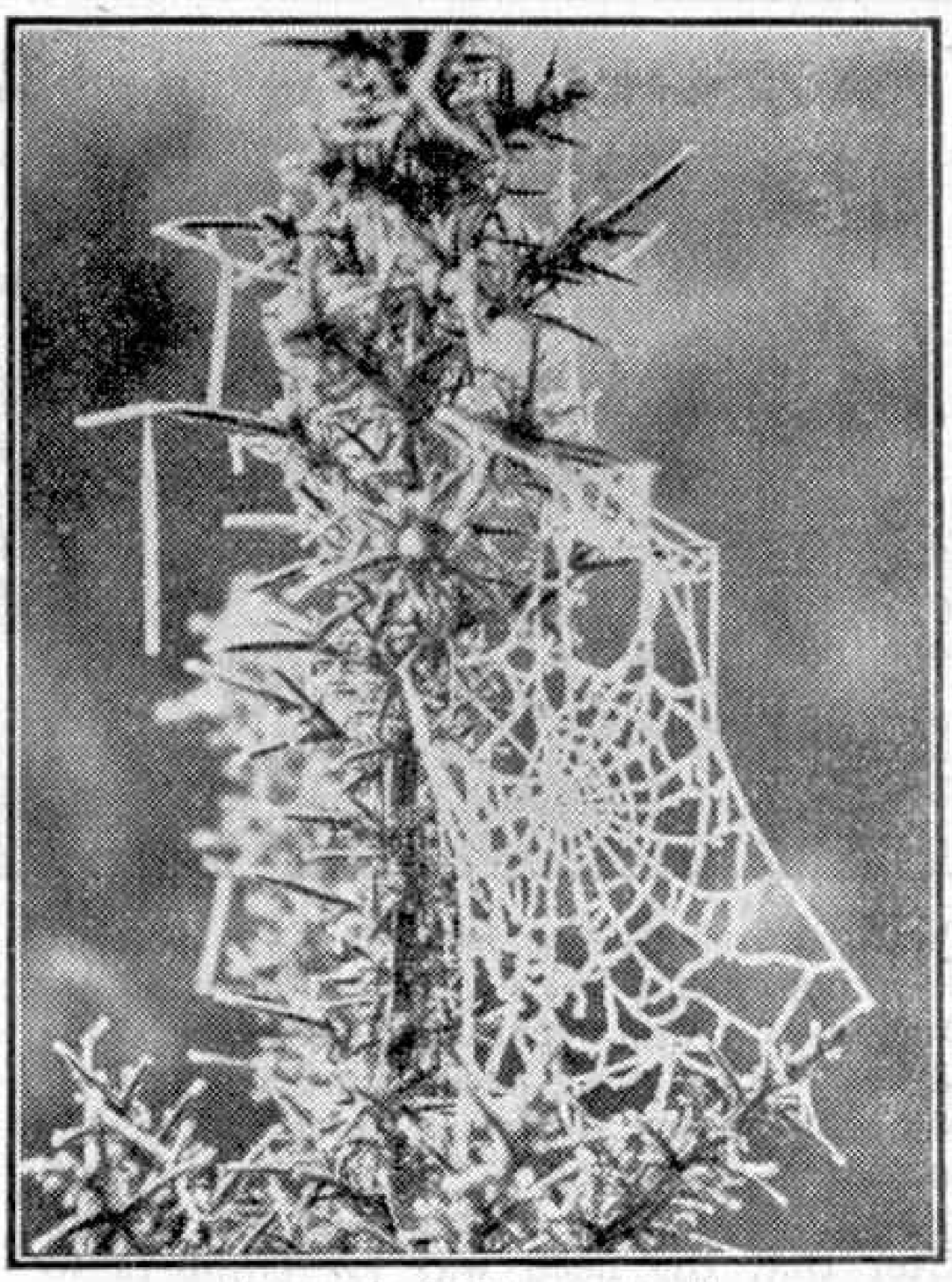
By E. E. Steele

THE arrival of the month of December immediately arouses thoughts of Christmas. In the town, in normal times Christmas conjures up memories of happy crowds of shoppers, of windows brightly dressed and all the glamour of lights and gaiety. Very different is Christmas in the country although not less enjoyable for its quieter atmosphere and absence of crowds. Children bring in heaps of berried holly for the simple decorations and the farmer runs a critical eye over the fat poultry in the yard soon to be sacrificed to the needs of Christmas dinner.



The curious appearance of hoar frost on wire.

Most years Nature herself takes a hand in the rural decorations, transforming the countryside into a fairyland with her frost and snow. Last Christmas in Lincolnshire it was especially beautiful. Thick fog prevailed for some days with a freezing temperature, covering outdoor objects and foliage with crystals of ice. The spider webs on the gorse bushes became so thickly encrusted that many of them broke under the strain, thereby giving a charming picture reminiscent of candles on the real Christmas tree.



"Nature's Christmas Tree."

The accompanying pictures show some of the camera possibilities of wintry days. Given suitable weather conditions pictures like *"Nature's Christmas Tree"* are plentiful, and even the usually uninteresting wire becomes attractive. The shooting party are starting off hopefully in the frost and mist. A holiday down on the farm at Christmas can be good fun.

Starting for the Christmas shoot.

The British Civil Air Fleet

by J.W.R.Taylor

FOR six years the British civil aircraft industry has been almost non-existent. During the first years our aircraft companies worked long hours, under a hail of bombs from the Luftwaffe, to give Fighter Command enough "Hurricanes" and "Spitfires" to save Britain and the world. After that the need was for bombers to carry the offensive into Germany.

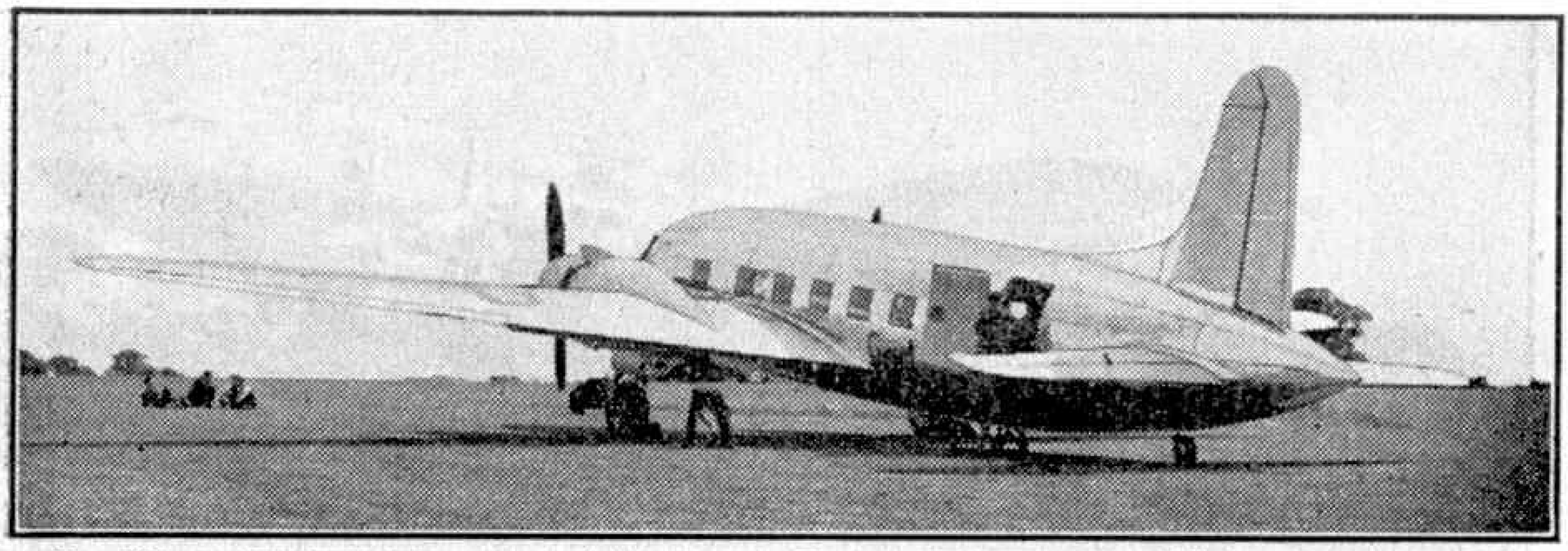
British Overseas Airways Corporation struggled to keep open our aerial lifelines, with hopelessly inadequate and out-of-date equipment. As their magnificent Empire flying-boats and modern air liners were lost one by one, often by enemy action, they were replaced by converted bombers, second-hand American transports, in fact anything that would fly. As a result, in 1942, Mr. W. D. Perkins, in the House of Commons, described the B.O.A.C. fleet as "A mixed assortment of aircraft consisting partly of old crocks, five, six, seven years old, many of them ripe for the scrap-heap . . . partly of R.A.F. throw-outs, crumbs from the rich man's table, and partly, owing to the generosity of our American friends, modern American machines."

In 1942 A. V. Roe were able to persuade the Ministry of Aircraft Production to permit them to design and build a transport aircraft, using "Lancaster" wings, engines and tail unit, but with a completely new fuselage. They were allowed to proceed with the work only on condition that it did not interfere in any way with "Lancaster" production, but they overcame all difficulties, and when the prototype "York" was ready for service, M.A.P. did not regret its decision. All the experience gained in developing the world's finest bomber had been put into the new transport, and it set an entirely new standard for British air liners. Its handsome square-section fuselage could accommodate easily four Jeeps, 10 tons of freight or 24-56 passengers. In addition its high-wing arrangement brought the fuselage low to the ground, making the "York" much easier to load than the average American transport. Some idea of its capabilities was given when a "York" transported Mr. Anthony Eden from Cairo to Teheran at an average speed of 229 m.p.h. For a "utility" air liner this was exceptional, and held great promise for the future when Britain could again get down to the job of building new air transports.

The aircraft shown in the heading is an Avro "Lancastrian," the type used by British Overseas Airways on their England-Australia service and regularly making the flight in 63 hours. Photograph by courtesy of A. V. Roe and Co. Ltd.

British engineers got their first real chance in 1943, when a Government committee, headed by Lord Brabazon—our No. 1 pilot—ordered seven civil prototypes from leading British companies. At the same time M.A.P. authorised the construction of several other transports outside the scope of the Brabazon specification.

Until the new machines were ready, B.O.A.C. planned to carry on with converted bombers — "Sunderlands," "Halifaxes," "Stirlings," "Warwicks" and "Lancastrians." Although these machines are merely conversions, that does not mean that they are second-rate. On the



The Vickers "Viking" twin-engined civil transport. Photograph by courtesy of Vickers-Armstrongs Ltd.

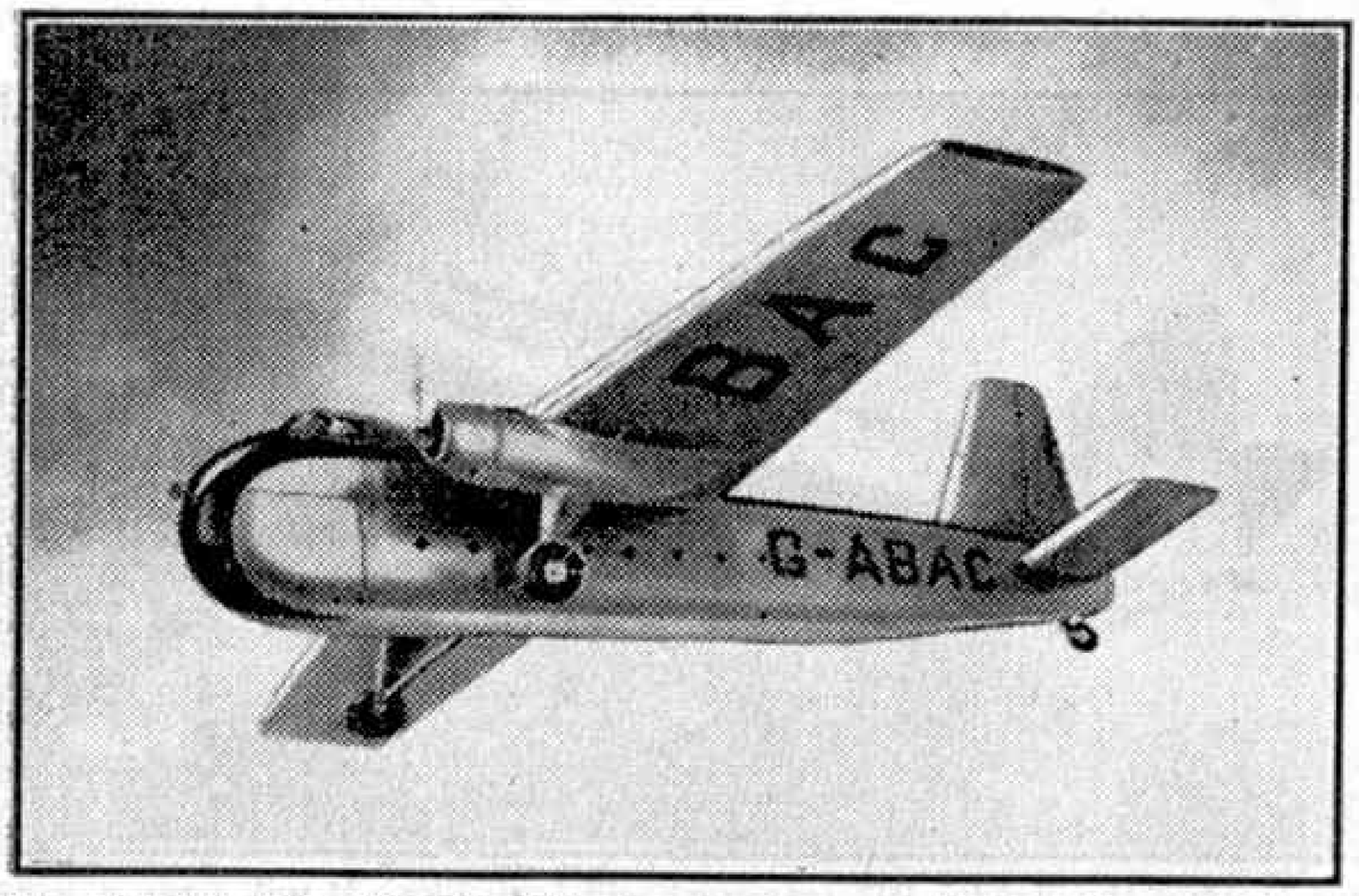
contrary, the "Stirling" V Civil Transport can carry 18 passengers and more than two tons of freight and mail for 1,800 miles at a cruising speed of 210 m.p.h. The "Halifax" VIII has comfortable seats for 11 passengers and can carry also four tons of freight in a bulbous pannier under its fuselage. And there can be no more convincing proof of the reliability and performance of these aircraft than the fact that B.O.A.C. are now running a regular 63-hr. air service to Australia with "Lancastrians," which thus encircle half the globe in well under three days.

But beyond all these "utility" air liners and bomber conversions, a new British civil air fleet is beginning to spread its wings—a fleet of modern, beautifully equipped aeroplanes bringing new standards of performance and safety to the world's airlines. Some are already flying, others such as the huge Bristol 167 and the Armstrong-Whitworth jet-propelled mail-plane may require years of development. but they will be worth waiting for.

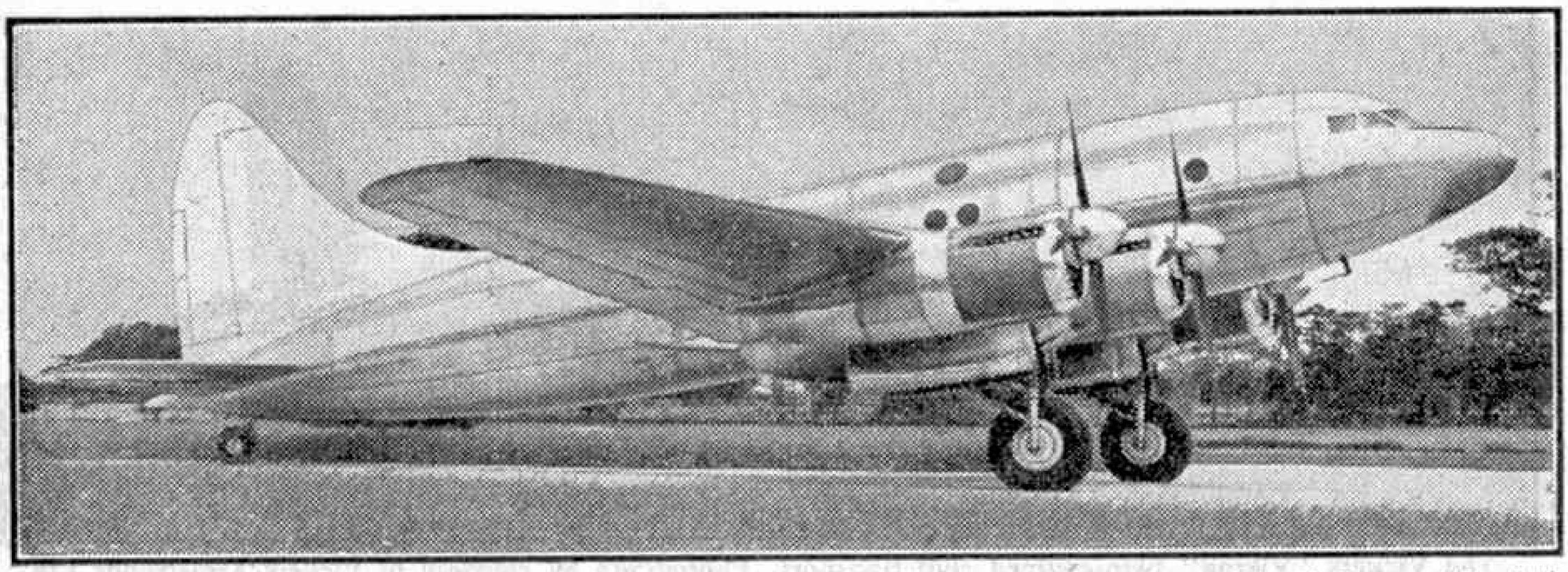
There will be transports to cater for every class of passenger and freight traffic. In the comparatively small feeder-line category there are the Miles M-56 and M-60 and de Havilland "Dove" (described in the June *"M.M."*) and the Miles "Aerovan" (described in the August *"M.M."*). Between these and the really large types come the Vickers "Viking" and the Bristol "Wayfarer" and "Freighter" medium-range airliners, whose range of 500-1,000 miles and low operating costs will make them ideal on air routes to the continent.

The "Viking" is a sleek, all-metal mid-wing monoplane powered by two 1,675 h.p. Bristol "Hercules" 130 engines. It combines a big payload and high performance with low initial cost and ease of operational maintenance. The low initial cost is made possible by the use of a large number of "Wellington" and "Warwick" components already in large-scale production. This has the added advantage that plenty of spares are immediately available for the airline operator. The "Viking" has a wing span of 89 ft. 3 in., is 62 ft. 10 in. long and has an all-up weight of 33,500 lb. It will be available in two models—Standard and de Luxe—accommodating a crew of two, an air hostess, and 27 or 21 passengers respectively. An idea of its low operating cost is given by a payload figure of 6.2 ton-miles per gallon for a range of 1,000 miles at a maximum speed of 210 m.p.h.

Safety and comfort for passengers has always been a peace-time tradition of British airlines, and the cabin layout of the "Viking" is typical of the new transports. The Standard model—the prototype of



The Bristol 170 "Freighter," shown above, is loaded through huge doors in the nose. Photograph by courtesy of Bristol Aeroplane Co. Ltd.



Avro "Tudor" I, the first British pressurised transport aircraft. Photograph by courtesy of A. V. Roe and Co. Ltd.

which flew on 22nd June 1945, has a spacious, well-lighted cabin nearly 30 ft. long and with 6 ft. 8 in. headroom. A broad gangway runs the entire length of the saloon and the individual seats are disposed three abreast, all but two rows facing forward, with a leg-room of 36 in. Each passenger has a very large window, a reading lamp, ash tray, magazine pocket and a cool air supply, the last being additional to the normal cabin air-conditioning.

The cabin is finished in moquette, quilted bedford cord and head cloth panels. Special attention has been paid to sound-proofing and anti-vibration measures. For emergency exit two roof openings are provided, while all the windows are designed as knock-out panels and the main entrance door is jettisonable. Just aft of the main entrance door on the port side of the fuselage is the toilet compartment, furnished with a chemical closet, wash basin, cupboards and all the usual fitments. A nicely-designed pantry is also provided for the stowage and preparation of food and drinks for consumption during flight. A 300 cu. ft. freight compartment runs the whole length of the cabin, under the floor, and can be loaded direct from the ground.

The Bristol 170 "Freighter" is not a handsome aeroplane. But it was designed to fill the need for a simple, reliable, twin-engined transport, capable of operating from small airfields with a payload of over four tons, with the maximum operational economy. Powered by two "Hercules" engines, it will have a normal range of about 500 miles.

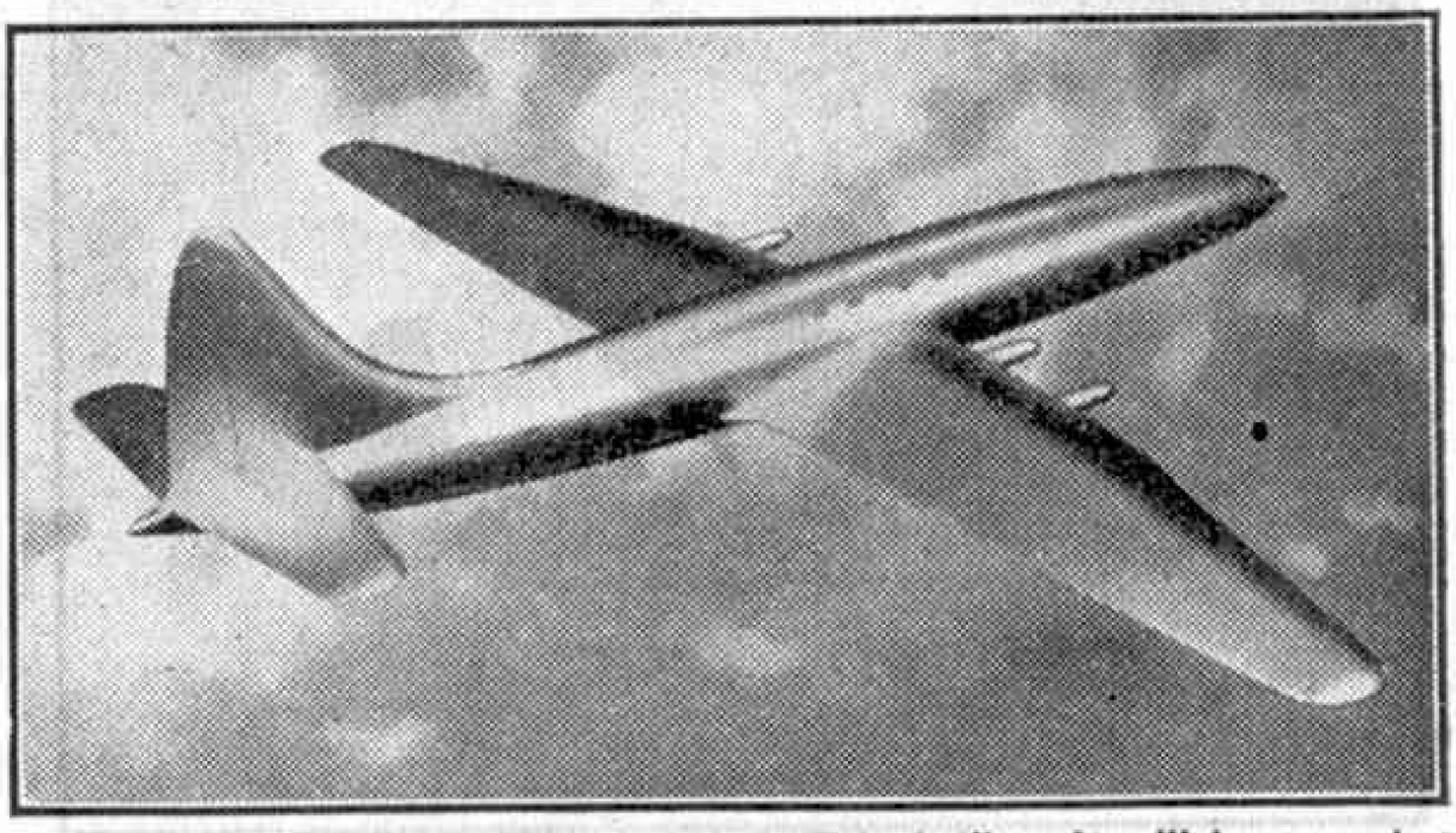
Bristols believe that the "Freighter" can become the goods wagon of the sky. They argue that nobody would transport heavy machinery in a Pullman car, or use a limousine for hauling gravel; and so why try to get the last ounce of performance out of a transport aircraft by the use of such expensive items as a retractable undercarriage, when the real proof of efficiency is low operating costs? So the "Freighter" is snub-nosed and angular, with a fixed undercarriage—but it is estimated that goods could be carried to Paris at a cost of only a penny a pound, which puts the "Freighter" in a class by itself. Loading is done through huge doors in the nose, and a heavy lorry can be accommodated with ease inside the spacious fuselage.

A passenger version—the "Wayfarer"—is also being built, with accommodation for 34 passengers. One private company has already put forward plans for operating a passenger service to Paris with these aircraft at a return fare of £4.

Entirely different from the "Wayfarer" are the four long-range airliners being built for Britain's Empire air routes—the Handley-Page "Hermes," Avro "Tudor," Bristol 167, and Short "Shetland" flying-boat (described in the September "*M.M.*"). These aircraft are luxury liners in the strictest sense and no effort has been spared to make them as fast and comfortable as possible. This has not been achieved with a total disregard of economy, but the Bristol 167, for example, will have a maximum range of nearly 5,000 miles, and comfort becomes a prime consideration on such a flight. The 167 will be the largest British air liner, with a wing span of 230 ft. and a loaded weight of 110 tons. It will be powered by eight of the new 2,500-plus h.p. "Centaurus" engines, completely submerged in the wing, and will carry 72 passengers on transatlantic flights, at a speed of about 250 m.p.h. Up to 224 passengers could be carried for short ranges, but the 167 is not intended for use on such routes. It is probable that production machines will be powered by jet-turbines, as Bristols are pioneering these power plants of the future.

Until the Bristol 167 is ready, the "Tudor" will be the flagship of B.O.A.C., and Avros have already received a substantial contract for this peacetime successor to their famous "Lancaster" bomber. The "Tudor" I, which made its initial test flight on 14th June last, is the first British pressurised transport aeroplane, and can thus help to ensure passenger comfort by flying above bad weather at a height of up to five miles. It is powered by four 1,850 h.p. Rolls-Royce "Merlin" 100 engines, and will carry 12 "sleeper" passengers on the North Atlantic route or 24 day passengers. The wing span is 120 ft. and the loaded weight more than 33 tons.

The "Tudor" I is, in fact, the perfect long-range transport for present needs, (*Continued on page 434*)



This is what the Bristol 167 transport will look like. It will have a wing span of 230 ft. and will be the largest British air liner. Photograph by courtesy of Bristol Aeroplane Co. Ltd.

BOOKS TO READ

Here we review books of interest and of use to readers of the "M.M." With the exception of those issued by the Scientific and Children's Book Clubs, which are available only to members, and certain others that will be indicated, these should be ordered through a bookseller. We can supply copies to readers who are unable to place orders in this manner. Order from Book Department, Meccano Ltd., Binns Road, Liverpool 13, adding 6d. for postage.

"IT CAN NOW BE REVEALED"

(British Railways Press Office. 1/- net)

Last year the British Railways Press Office described some of the railways' wonderful war work in "*British Railways in Peace and War*," which was reviewed in our April 1944 issue. Now comes this sequel, a most absorbing booklet of 60 pages telling many stories that previously could not be given for reasons of security. This is very attractively printed and is illustrated with 62 excellent photographs, while a very full index also is provided. It is obtainable from railway bookstalls.

The booklet is valuable in that it shows how greatly the efforts of the four British main line railways and London Transport contributed to final victory, answering every call for transport and for armaments in the face of enormous difficulties. We begin to realise how much they did in unsuspected directions with the very first chapter of the booklet, which deals with the great variety of armaments made in railway workshops, ranging from guns, ammunition, tanks and aircraft to bombs, bridges, rafts, motor boats and midget submarine superstructures. Then we see how the railways carried the material produced by themselves and in the countless war factories new and old in all parts of the country. This involved considerably more than merely running trains, for many new lines had to be laid and great new goods sidings created. Special stations too were necessary to accommodate the workers in these factories. The railways were behind the bomber offensive also, for new airfields sprang into existence all over the country and the railways had to carry material for building them and to keep them supplied with bombs and other necessities.

Other high lights of railway service in the war came with D-Day. The railways were responsible for the movement of vast numbers of troops and enormous quantities of equipment in preparation for this, and the climax came in the last three weeks before invasion, with the operation of nearly 10,000 special trains. Then over 1,000 flying bombs fell on or close by railway lines, stations and goods yards, but railwaymen performed prodigies of swift reconstruction that enabled the trains to go through.

Now comes the problem of regaining and surpassing peacetime standards of public services. The intention is to equip the railways and London Transport and to train their staffs so that the finest railway service in the world can be offered to the British public, no light task owing to wartime losses. The last chapter in the booklet explains how this is to be done.

"SECTIONED PERSPECTIVE VIEW OF LOCOMOTIVE FRONT END"

(The Railway Gazette. 2/6 net)

"What makes the engine go?" is always an intriguing question; the answer is very graphically conveyed in this sectioned perspective drawing of the front end arrangements of an L.M.S. class "7P" 4-6-2 locomotive of the non-streamlined "Duchess" series, which is the work of Mr. V. C. Stockton of the L.M.S. technical staff at Derby. The L.M.S. and Mr. Stockton are to be congratulated on the effective result achieved, while in publishing the drawing in handy reprint form "*The Railway Gazette*" have performed a notable service to the locomotive engineer, the student and the enthusiast.

The drawing interprets the term "front end" very liberally indeed, for it commences its sectioned story with the characteristic Stanier top feed appliances; regulator and superheater details follow, and then the steam pipe layout and steam distribution and exhaust arrangements. Valves and pistons are shown in a most instructive manner, as are the double blast pipe and chimney, which are still sufficiently uncommon in British practice to savour of the mysterious. Variations in the thickness of the lines and the use of shading help to make the drawings clear, and the main parts are clearly numbered so that they can be identified readily from the key. The production is completed by the inclusion of a dimensional drawing and a half-tone reproduction of one of the "Duchesses" at work.

Owing to difficulties due to the war, it is impossible to guarantee prompt delivery of books ordered as described above.
Every effort, however, will be made to ensure speedy despatch.

WARNE'S PICTURE STORIES FOR CHRISTMAS

Our youngest readers will be attracted by a series of handsome picture books for children that have been published by Frederick Warne and Company Ltd., all telling animal stories. Three of them are about dogs. **"Chappie,"** by Constance Heward (2/6), is the story of a dog who wasn't wanted, for he knew no tricks, and was always in some mischief or other. But he showed his worth when Boy fell down a quarry and was lost, for he kept his little friend close and safe until rescuers reached them. In **"Peter the Pup,"** by Lilian Gask (2/6), we meet another odd little dog who got into trouble with everybody so that he had to be sent away. Adventures and hard times then came along, but there was a happy end for him too. **"Parachute Pup,"** by Decie Merwin (5/-), has a more up-to-date touch, for Paddy, its doggy hero, who lived on a farm, was used by two boys to try out their idea of a parachute, with the result that he made a wonderful journey by air that got his name into the newspapers.

In **"The Adventures of Frederick,"** by Lilian and May Wood (3/6), we are introduced to a nice family of polar bears, and to the baby Frederick, who wandered very far away indeed from his Arctic home. One adventure followed another and eventually he found himself flying through the clouds in an aeroplane in the middle of a terrific thunderstorm. How he landed, in Africa of all places, and what he did there, makes an interesting tale. **"Needles,"** by Elsie Bindrum (4/-), the story of a little porcupine that was actually seen by the author while on holiday in America, is a pleasant change from the familiar cat dog and cow stories.

CHILDREN'S GAMES AND AMUSEMENTS

Youngsters and parents alike will welcome another book by Morley Adams. This is **"The Children's Book of Games and Amusements"** (5/-), published by Faber and Faber, and it includes ideas for home-made toys, tricks with matches and corks, card tricks and fun with paper, together with a special card games section for the little ones. Those who are faced with the problem of making a party "go" will find the suggestions for round and table games just what they are looking for. This is a jolly book.

Railway Notes

G.W.R. Locomotive Stock Changes and Notes

New 0–6–0 goods engines numbered 2246–50 are now in service, so completing a further series. Further 0–6–0 pannier tanks lately completed include Nos. 9610–14. No. 1,000, the pioneer Hawksworth 2-cyl. 4–6–0 of the latest type, has been working a good deal on the 9.10 a.m. Paddington to Birmingham and Wolverhampton express, returning with the corresponding up train from Birkenhead, arriving Paddington at 5.40 p.m. the same day; this is a regular working provided by Old Oak shed. Nos. 1001/2 are running in the West of England. Withdrawn locomotives of the old school include No. 2348 of the Dean "maid of all work" freight and mixed traffic 0–6–0 type; No. 2652, another of the "Aberdare" inside cylinder 2–6–0 mineral series dating from 1900, with double frames and outside springs to the driving wheels, which are only 4 ft. 7 in. in diameter; No. 848, an ancient Welsh 0–4–2T; No. 3578, of the "1159" class tank of the same wheel arrangement; and 0–6–0 tanks of the earlier standard classes numbered 1527, 1703 1725 and 1887.

More and Faster Trains

As a step towards the restoration of more normal train services, considerable improvements were effected on the inauguration of the winter time tables on 1st October last, both as regards speed and frequency of main line and local trains. Some restaurant and buffet cars also reappeared. Owing to the intensity of the war effort it will be some time before full services can be provided on many lines, as a vast amount of leeway has to be made up in the way of repair and renewal of rolling stock, which is still in great demand for Service traffic. Many thousands of railwaymen are still serving in H.M. Forces.

Gunpowder Vans Lose Their Anonymity

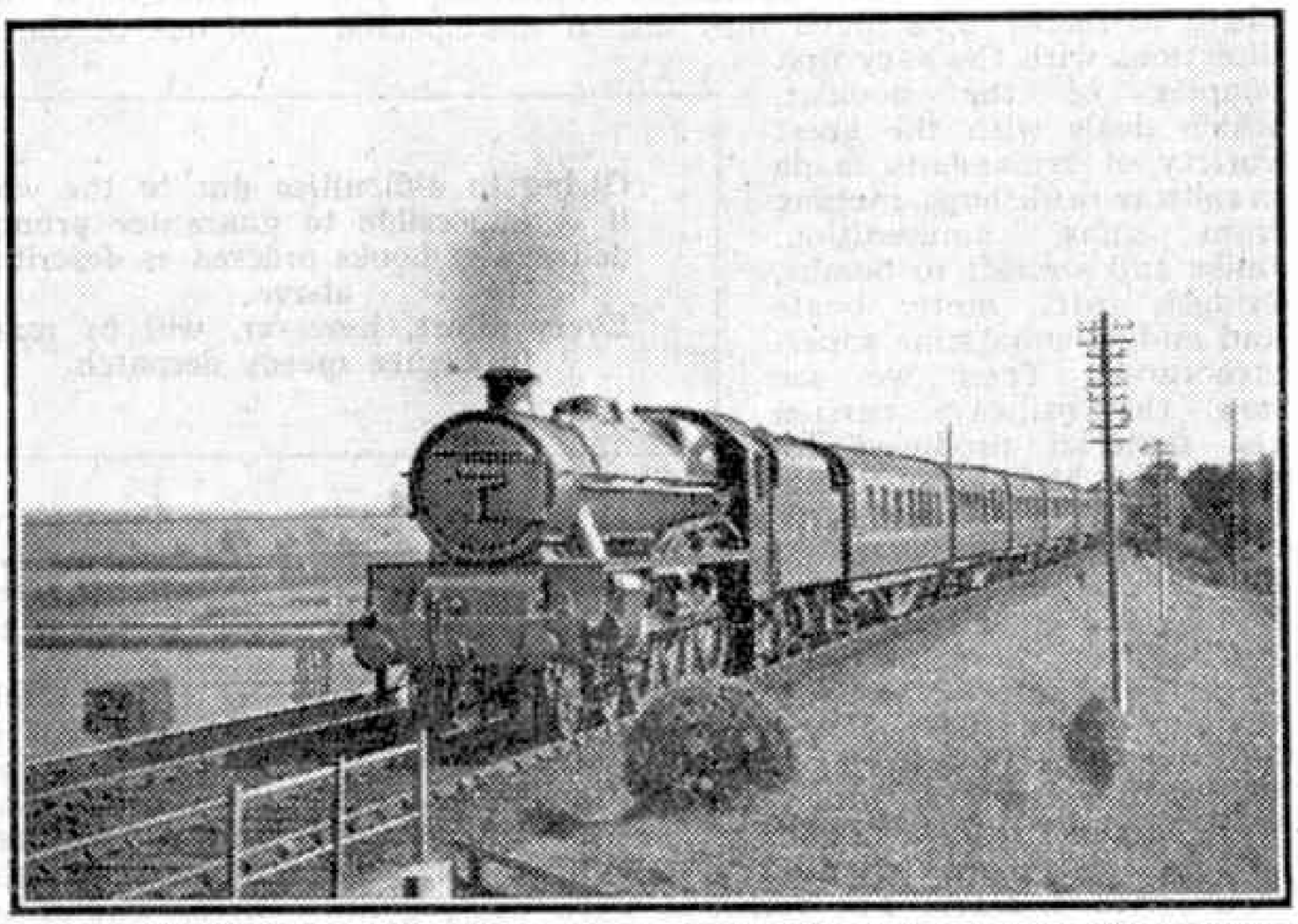
In 1940 the words "Gunpowder Van" were obliterated for security reasons from the regular and improvised stock of freight vans used for conveying ammunition and explosives on British railways. Instead a white letter "G" in a black and white circle was painted on the bottom left hand corner of the sides of the vans. As the vans pass through shops the pre-war lettering will be restored to all those vehicles that continue to be available for this dangerous traffic, which requires special precautions in marshalling and handling.

L.N.E.R. "Great Northern" in a New Guise

Early in 1922 the railway world was stirred by the appearance of the first Gresley "Pacific" built at Doncaster for the former Great Northern Railway, appropriately named "*Great Northern*" and numbered 1470, altered to 4470 in 1924. She was the precursor of the "A1" class of 52 locomotives with boiler pressure of 180 lb. per sq. in., soon to become notable throughout the East Coast route. As readers are aware, the type was developed into the more efficient 220 lb. per sq. in. series. Those still in the original state were lately reclassified "A10." In 1935 there came the "A4" streamlined version, with boiler pressure of 250 lb. per sq. in., which on the high speed streamline expresses set up entirely new standards of British locomotive performance.

Mr. E. Thompson, the present Chief Mechanical Engineer, has now rebuilt "*Great Northern*" to a new standard "A1" design incorporating "A4" boiler, though not streamlined, larger piston valves and longer valve travel. The three cylinders are of 19 in. diameter, as on the "A3" and new "A2/1" classes, but the latest Thompson plan is followed of placing the outside cylinders farther back, behind instead of between the bogie wheels, and instead of the Gresley derived gear coupled to the outside motion a separate set of Walschaerts valve gear attached to a crank axle actuates the inside cylinder, which drives on to the leading pair of driving wheels. Thus the drive is now divided, since the outside cylinders drive the middle pair. The engine wheelbase has been increased, as there is a greater space between bogie and driving wheels.

No. 4470 has double chimney and blastpipe, a new drop grate with hopper ash pan to facilitate quick release of ashes, a steam collector dome, a raised running plate without splashers, left hand drive and outside reversing rod. The tractive effort at 85 per cent. boiler pressure is 37,397 lb., and the maximum cut-off is increased from 65 to 75 per cent. The total weight in working order, including the latest model eight-wheel tender, is 159 tons, compared with the original 148–150 tons. Several of these features have now become standard practice on the latest new or rebuilt engines. We reproduce a photograph of the new "A1," which should be an impressive performer.

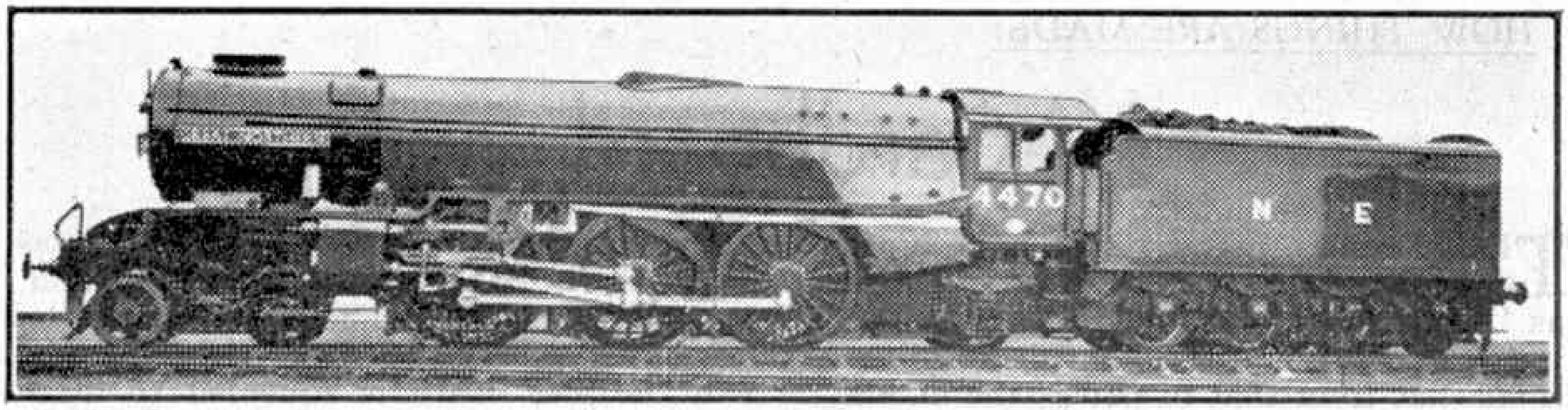


L.M.S. "5xP" 4-6-0 No. 5583 on an Anglo-Scottish express. Photograph by H. C. Casserley.

A Notable Junction on the L.M.S.

Trent Junction on the Midland main line to and from the north is a remarkable place. There is no town or village thereabouts so named, and it takes its title from the River Trent, in the valley of which it is situated, more or less in open country. The nearest town is Long Eaton, not far to the north. Derby is 8¾ miles to the west and Nottingham is 6¾ miles east. The main line from St. Pancras and Leicester approaches Trent through a short tunnel with castellated stone portals, and then straight over the river bridge. There are four tracks. South of the platforms a direct double line goes off to Derby, and this is used by London-Manchester expresses.

Trent station has an island platform serving down and up passenger lines, while goods roads pass outside. There is such a network of loops, spurs, connecting links and crossovers at each end that it is possible to start in either direction from either platform for Derby. An up express for St. Pancras,



L.N.E.R. No. 4470 "Great Northern." The first "Pacific" built by the former G.N.R., as now rebuilt with boiler pressure of 250 lb. per sq. in., and a double chimney. She is experimentally painted Royal blue. Photograph by courtesy of the L.N.E.R.

say from Leeds, using the direct Trent Junction-Leicester route, would start from the up platform as might be expected, yet across the platform on the down line there could also be one similarly bound, though via Nottingham and Melton Mowbray, that would be going in the opposite direction, having come in from Derby by means of the other southern spur from Sheet Stores Junction, which is adjacent to the L.M.S. Company's wagon-sheet works and stores. The Trent junctions link the Nottingham and Derby groups of main lines and branches, while useful connections from one train to another are also provided at the station.

The north main line proceeds straight on through the industrial Erewash Valley to Chesterfield and Yorkshire, soon passing the great mechanised marshalling yards at Toton, where there are fan-like groups of sidings into which wagons are sorted at a remarkable rate after being pushed over the "hump" by diesel electric locomotives and having their speed checked by hydraulic brakes as they descend over points changed rapidly as required by electro-pneumatic action operated from a control tower. The well known L.M.S. "Beyer-Garratt" 2-6-0 : 0-6-2 engines take a considerable share in handling the heavy goods and mineral traffic past Trent. Most of the ex-Midland as well as standard L.M.S. locomotive classes also may be seen at this famous junction, apart from the largest express types.

A Class "5" Makes Up Time

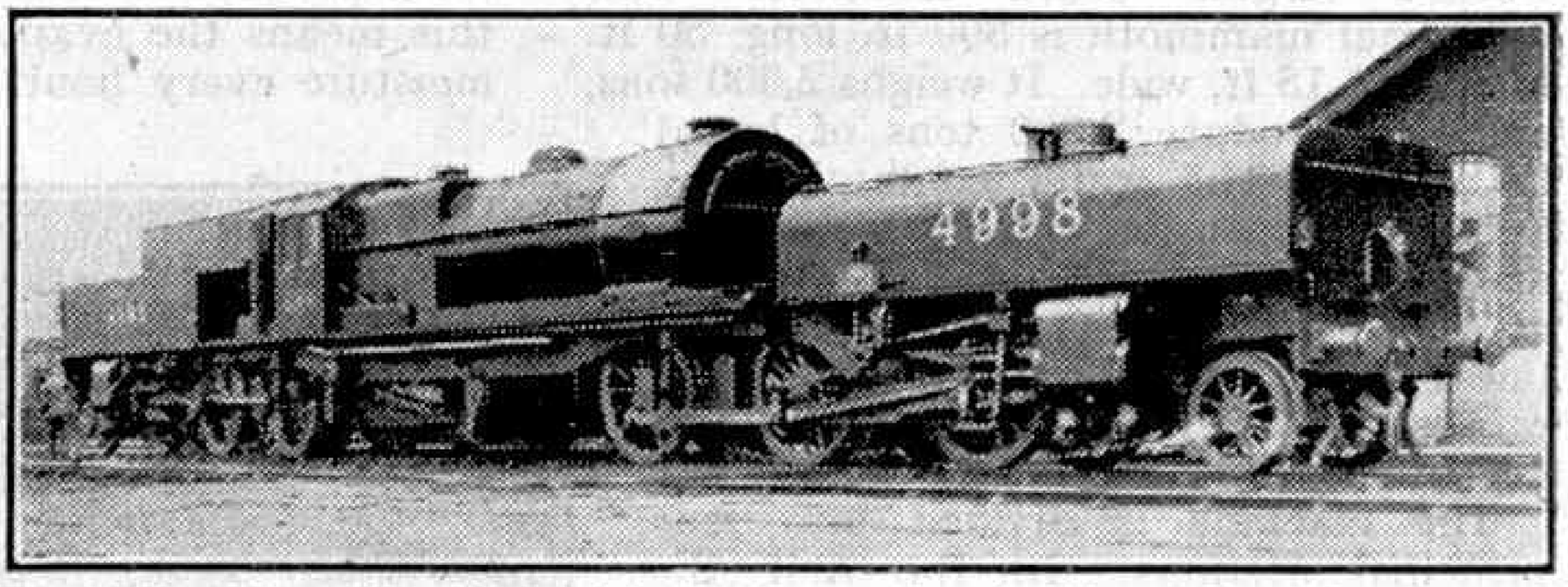
The Midland Division main line of the L.M.S. was notable in normal times, particularly south of Derby or Nottingham, for fast and frequent expresses of comparatively light formation that were operated at decidedly high speeds, considering the heavy grading. Especially was this so after the "Jubilee" 3-cyl. "5XP" 4-6-0s took over the majority of the workings, but their mixed traffic class "5" sisters with driving wheels only 6 ft. in diameter proved capable of keeping time or even improving upon it on occasion with mile-a-minute trains. In war conditions the main line services were decidedly slowed, as the majority of long distance trains called at all principal stations and were usually crowded, although a good deal longer than in peacetime.

The class "5" if in good trim was an ideal engine for such duties, and we recently received news of an enterprising effort of one of the new series of these "Black Staniers," No. 4846, hauling 13 coaches, or about 420 tons in all behind the tender, from Leicester to St. Pancras on an evening express making four stops. One minute of a late start was regained on the first 27 mile stage over Kibworth and Desborough summits to Kettering stop. Fast travel past Wellingborough and a good climb up the 1 in 120 towards Sharnbrook brought the train into Bedford station in exactly 27 min. compared with the 31 allowed from Kettering. The large number of passengers and the length of train now necessitated a second drawing up at each halt, with consequent loss of time, yet with an absolutely clear road the driver more than recouped this, concluding with an exhilarating run up to St. Pancras in 23¼ min. start to stop over the 20 miles from St. Albans. This was an excellent performance with 420 tons, giving an arrival only 10½ min. late, although the train had been about 15 min. behind time at Bedford and St. Albans.

Southern News

We learn that "Merchant Navy" engines have lately been named as follows No. 21C 16 "*Elders and Fyffes*," No. 21C 20 "*Bibby Line*," and No. 21C 19 "*French Line—C.G.T.*" in honour of the Campagnie Generale Transatlantique, alongside whose fine liner "*Ile de France*" in Southampton Docks the naming of the last named "Pacific" took place.

Of the new "West Country Pacific" type No. 21C 111 was on exhibition at Ashford before proceeding to her Devonshire location. This engine travelled "light" from Brighton by way of Lewes and Hastings. Construction of these fine locomotives continues, Eastleigh and Ashford works contributing important parts. Erecting, finishing, painting and trial steaming are all carried out at Brighton.



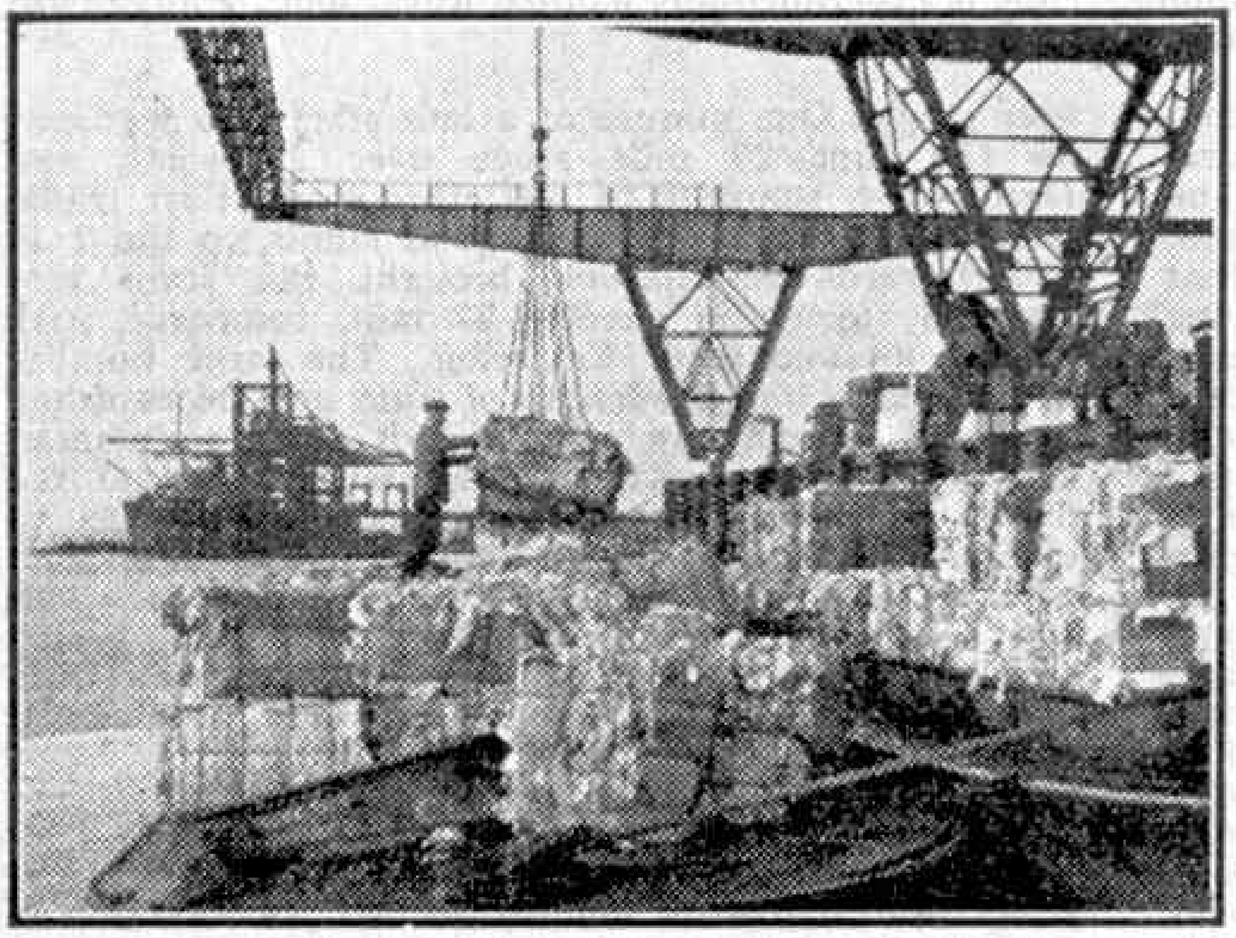
One of the "Garratt" articulated freight locomotives familiar at Trent Junction and Toton, on the Midland Section of the L.M.S. These engines are now numbered 7967-99.

The first of a new series of main line corridor composite coaches has just been placed in service by Mr. O. V. Bulleid, the Chief Mechanical Engineer, providing four first class and three third class compartments. There are large windows, the view being uninterrupted by compartment doors on the non-corridor side. Intermediate doorways and vestibules are provided between the first and third class sections, as well as at the ends. The carriages are 67 ft. 1 in. long and have a tare weight of 34 tons.

HOW THINGS ARE MADE:

Cardboard

THE familiar material we call "Cardboard" is known in the trade simply as "Board." It is really thick stiff paper, but the process of manufacture differs somewhat from that of paper, the making



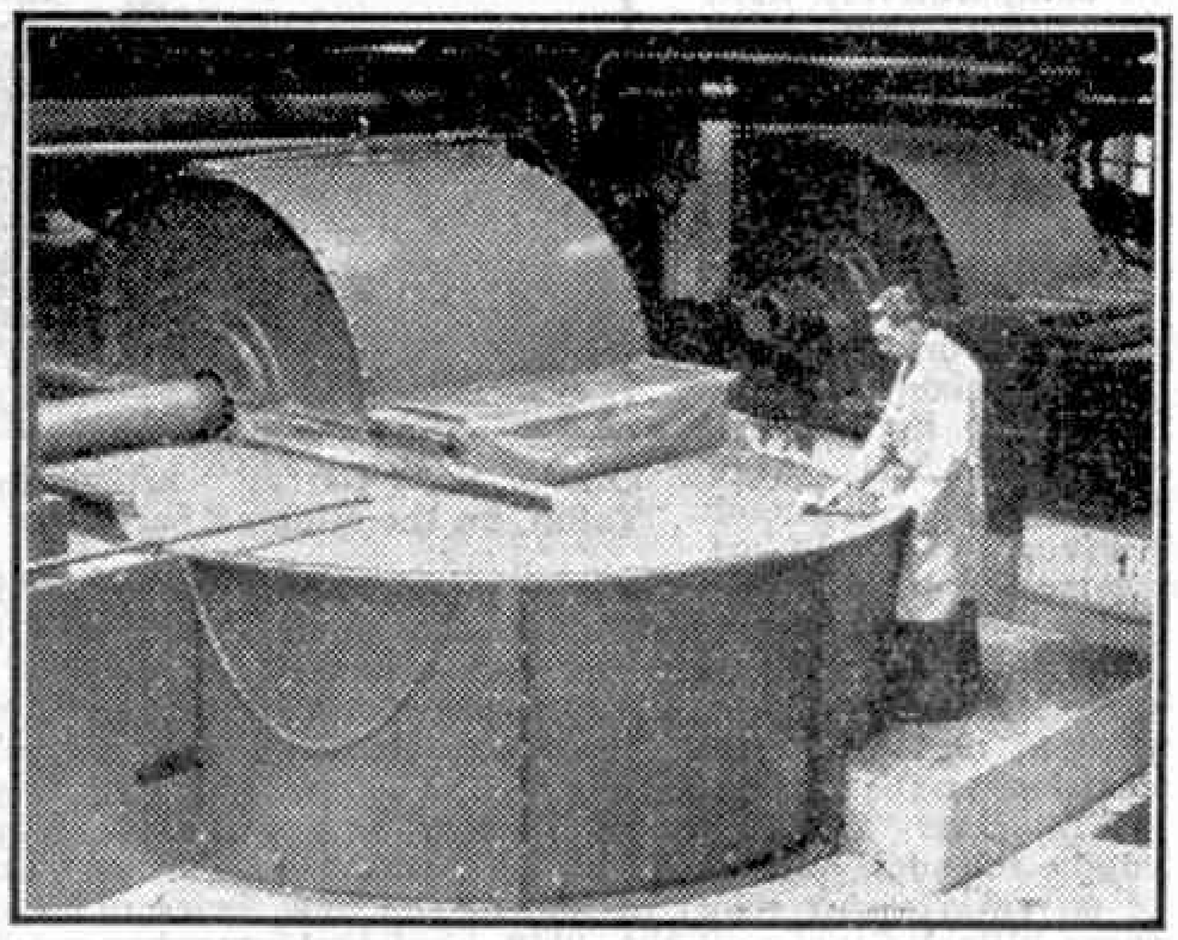
One of the electrically-driven cranes which unload raw material at Thames Board Mills. Illustrations by courtesy of Thames Board Mills Ltd.

of which was described in the January and February 1945 issues of the "*M.M.*"

A modern board machine is one of the largest units of mechanical equipment in industry, and Britain claims to have the world's largest board machine. This industrial mammoth is 300 ft. long, 50 ft. high, and 15 ft. wide. It weighs 2,000 tons, and can produce 2,000 tons of board in a week. The water containing the fibres in suspension enters at one end, and board, dried and finished, emerges at the other end, at the rate of 400 lineal feet per minute. The whole process is continuous from one end to the other.

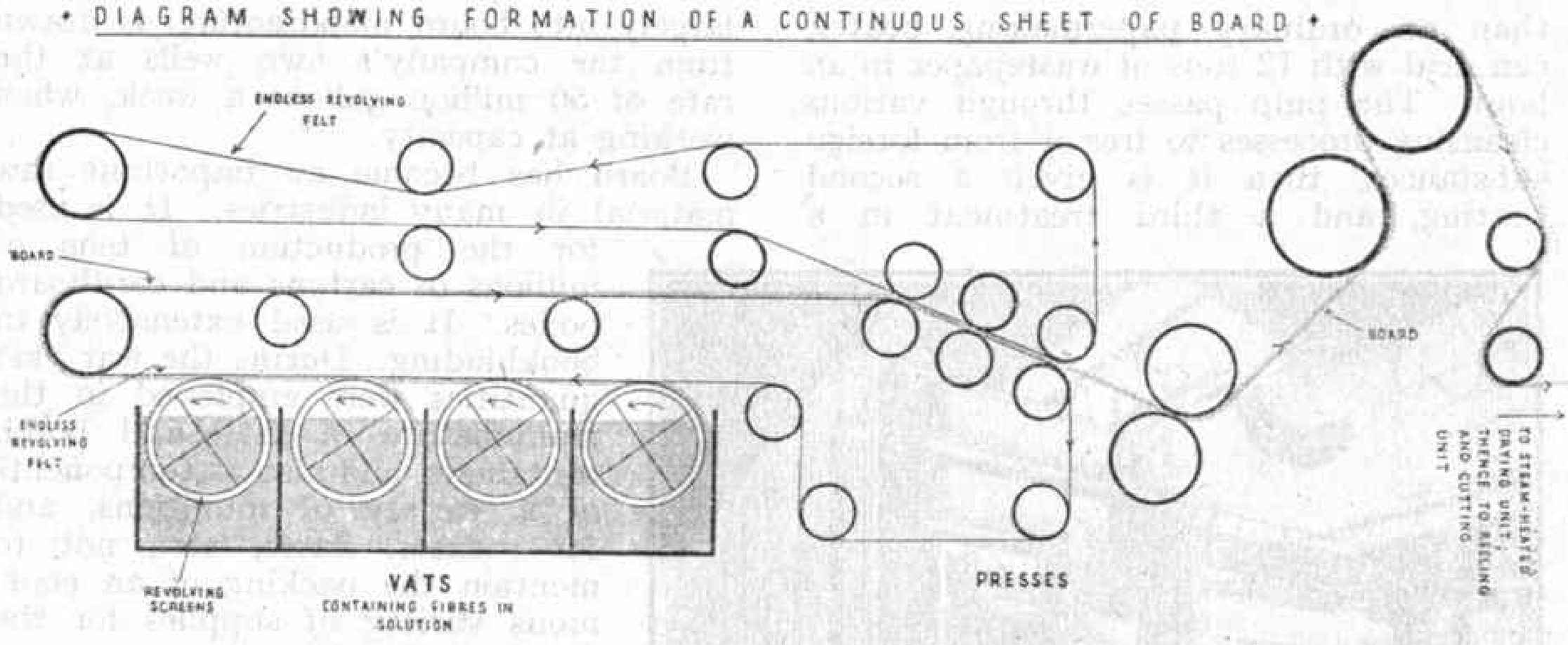
The machine is divided into four principal sections. In the first the board is formed. This consists of a series of wire-covered cylinders revolving in vats. The watery suspension of fibres enters these vats and is gradually drawn off leaving a thin deposit of interlaced fibres on the "mould," as the wire cylinder is called (see diagram). This layer is picked up by a travelling band of woollen felt which passes over each of the cylinders in turn. In this way a deposit of wet fibres is formed on the felt, which passes on to the next section—the press section. Here a top felt joins that on which the fibres have been laid, and between the two the wet board is squeezed to drive out as much moisture as possible. Then the sheet runs detached from the felt on to the steam-heated drying cylinders which evaporate most of the remaining moisture. Normal board and paper always retains a small percentage, otherwise it would be hard and brittle.

In this machine there are 156 of these drying cylinders, each 4 ft. 6 in. in diameter. The construction of an efficient drying cylinder is not as simple as it appears on the surface. The steam has to be introduced into a revolving cylinder without leakage, and the water which condenses has also to be continuously removed, otherwise the cylinder would soon lose its drying capacity. In addition to this, they are extremely heavy and must revolve at a steady speed; those nearest the back of the machine have to revolve at a faster rate than those at the front owing to stretching of the board as it dries. For every ton of finished board produced 1.5 tons of water have to be removed in this drying process. At a productive rate of 12 tons an hour, this means the evaporation of 18 tons of moisture every hour. In order to ensure



Taking a Laboratory sample during the pulping operations in a "Beater."

DIAGRAM SHOWING FORMATION OF A CONTINUOUS SHEET OF BOARD



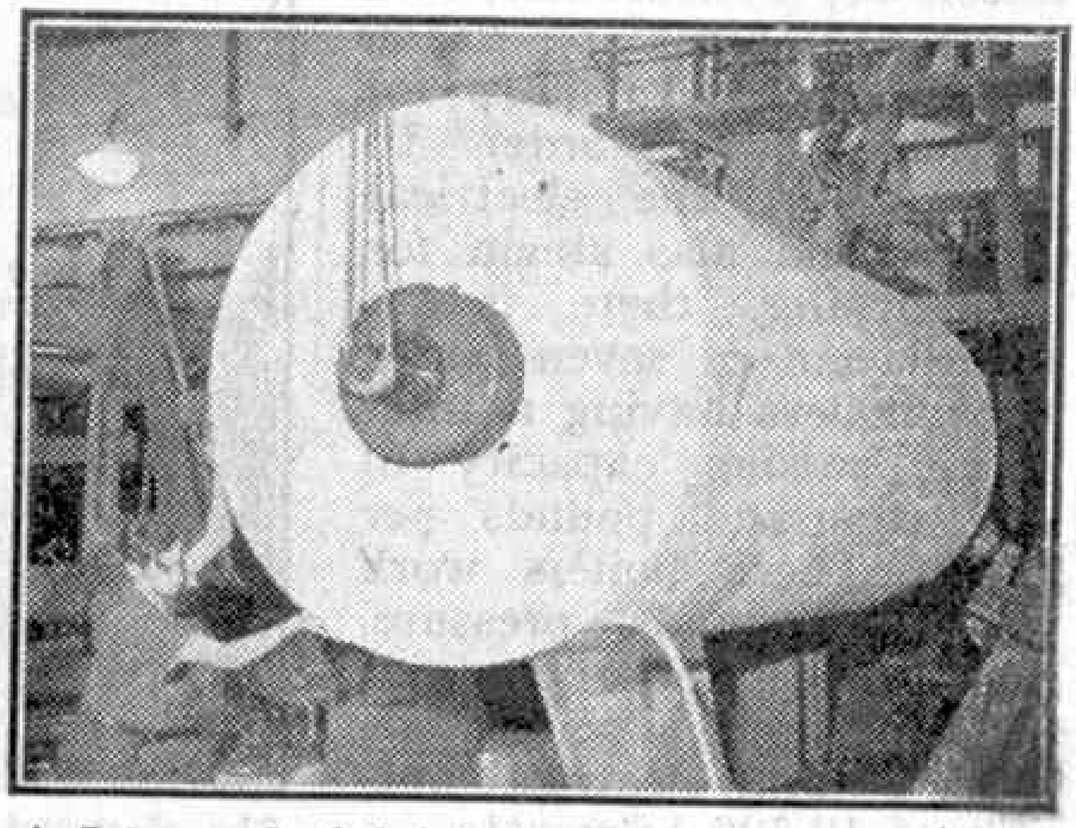
that the machine is not blanketed in steam, a vapour-absorption plant is fitted to the machine in the dryer section which supplies heated air that absorbs the evaporated moisture and carries it away through the roof of the building.

The fourth section of the machine consists of the calenders, heavy, polished steel rolls arranged vertically in stacks, which compress the board and give it a smooth surface. This process is somewhat similar, in effect, to that of ironing a starched shirt. The smooth rolls, which are moistened with water, virtually iron the board, which at this stage emerges from the machine finished, with the exception that it now has to be rolled up into reels or cut into sheets. The winder, which slits the board into reels of suitable widths, works at the uncanny speed of 1,500 ft. a minute. Sheets are cut from a roll in an automatic cutter, which also automatically piles the cut sheets into neat stacks ready for packing.

The machine we have just described is the largest of six operating in the Purfleet Mill of the Thames Board Mills. There are five other machines, all working on similar principles, including a new one, known as No. 8, the construction of which commenced just before the war and was actually finished after the war had started. Two other machines, known as Nos. 6 and 7, also of modern construction, are installed at the Warrington Mill which was opened in 1937. The total output of the two mills working at full capacity is 7,000 tons per week. Board is produced in various qualities from a thickness of thirteen thousandths to forty-five thousandths of an inch. Thicker boards are built up by combining in a separate machine known as a paster.

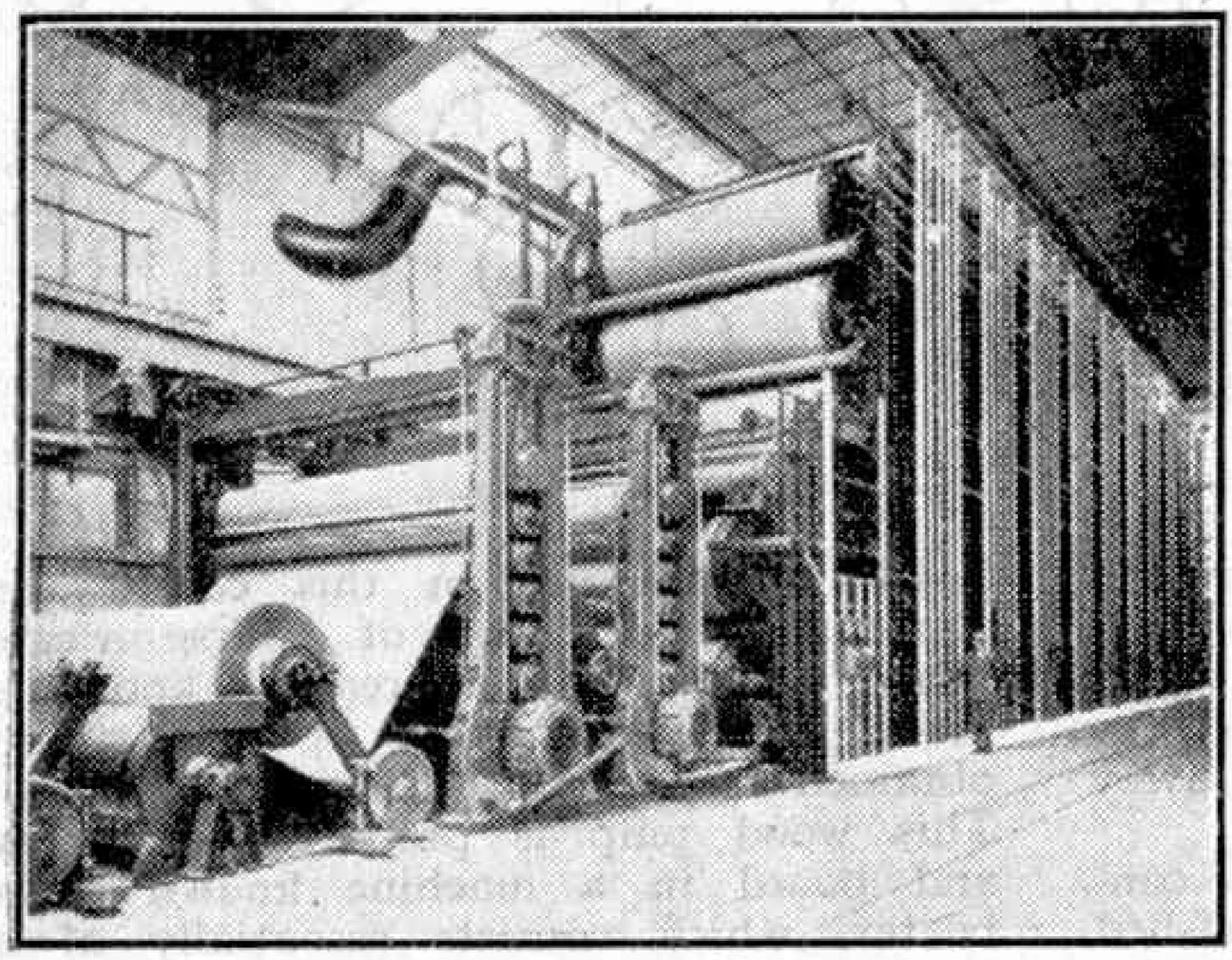
The principal raw material used in board manufacture in this country is wastepaper, including of course waste board. Paper, as our readers know, is made from wood fibre or wood pulp obtained mainly from such trees as spruce. This wood pulp is prepared for paper and board in a machine known as a beater, which consists essentially of a large revolving roll, having blades fixed transversely on its circumference, working against another set of blades known as the bed-plate. The wood pulp and water are introduced and the machine cuts and tears up the material into its component fibres. As, however, paper consists of wood or other vegetable fibres such as esparto, or even rag, it can be re-manufactured again into either board or paper. Paper, however, is usually made from fresh wood pulp, while wastepaper is the main raw material in boardmaking.

In the mill we are describing, the wastepaper is brought in in large bales which are broken open and turned into what is known as a breaker beater. One of these beaters, which is much larger



A 5-ton reel of finished cardboard being removed from a board-making machine.

than an ordinary papermaking beater, can deal with 12 tons of wastepaper in an hour. The pulp passes through various cleansing processes to free it from foreign substances, then it is given a second beating, and a third treatment in a



The world's largest board-making machine at Thames Board Mills. This machine is 300 ft. long, 50 ft. high and 15 ft. wide, and weighs 2,000 tons.

machine known as a refiner, which name describes the operation. The pulp is then finally screened, and passes on to the board machine at a dilution of one part of fibre to 200 parts of water.

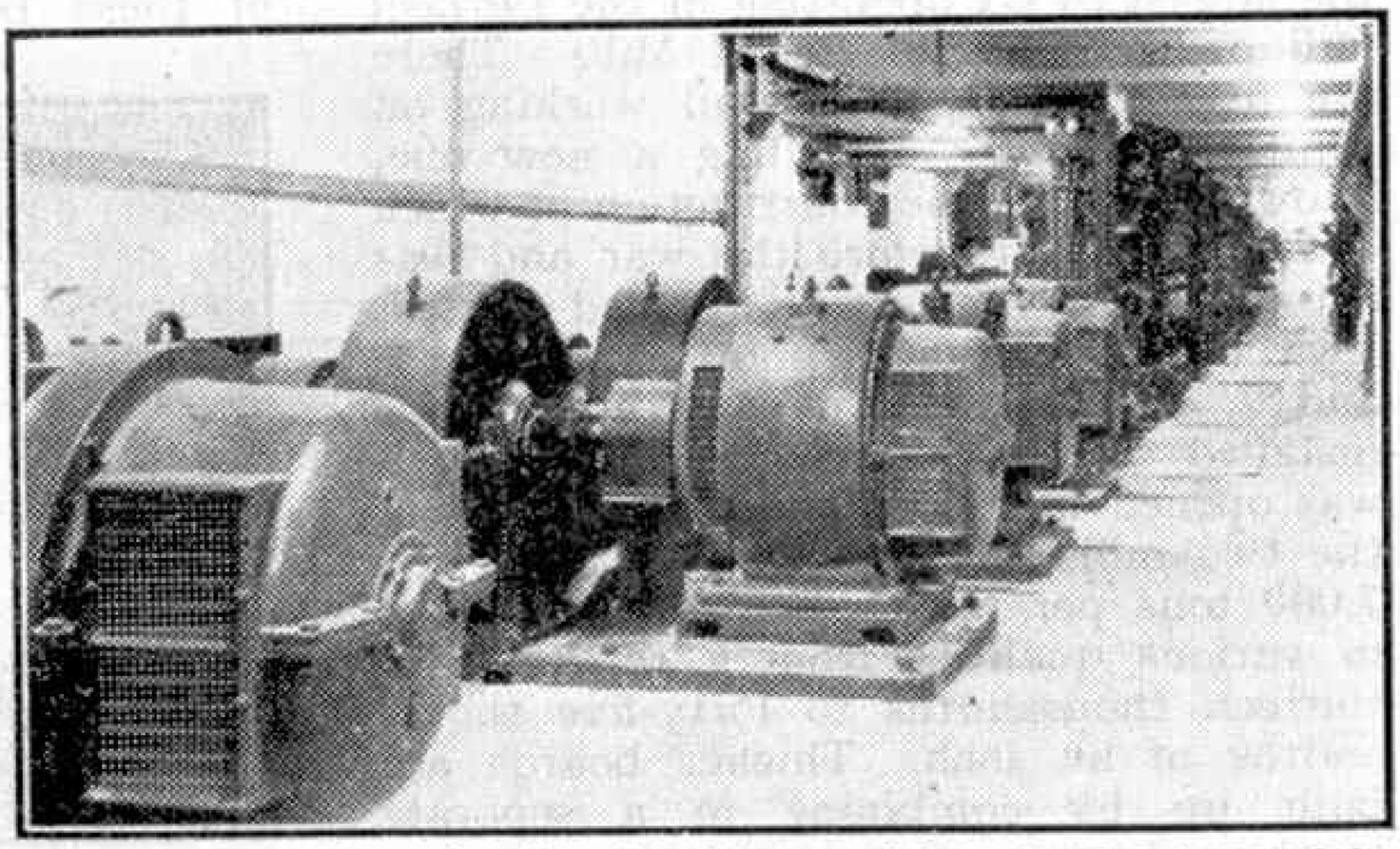
At the Thames Board Mills all plant is electrically driven. At the Purfleet Mill there are no less than 1,200 electric motors, driving beaters, refiners, screens, and the board machines themselves. The electrical drive of the board machine is very complicated as the revolution of all the various parts—cylinder moulds, presses, drying cylinders and calenders—must absolutely synchronise, and allowance must be made also in speeds to allow for stretching. In order to provide for the electrical power, and also steam for the drying, there is an installation of seven water tube boilers having a total steam raising capacity of 460 thousand pounds per hour. These boilers work at 350 pounds pressure. The power house contains seven turbo - generators, with a total electrical output of 12,500 kilowatts.

Water, which enters very largely into board manufacture, is drawn from the company's own wells at the rate of 50 million gallons a week, when working at capacity.

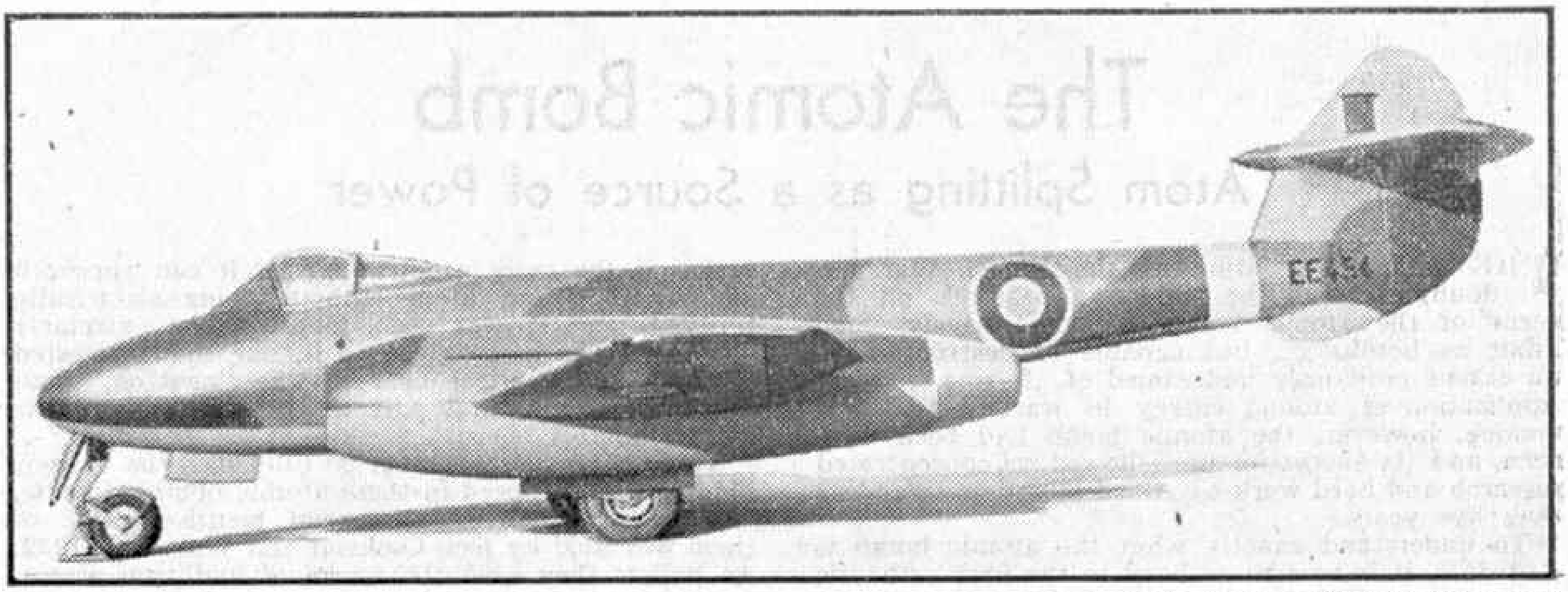
Board has become an important raw material in many industries. It is used for the production of tens of millions of cartons and cardboard boxes. It is used extensively in bookbinding. During the war vast quantities were employed in the manufacture of shell and bomb containers, and also as components of a variety of munitions, and for rockets, flares, etc., not to mention the packing of an enormous variety of supplies for the Services. It also enters as a raw material into a number of other trades, being employed in the manufacture of plasterboard, an important building material.

The output of board, however, is at present restricted owing to shortage of raw material, and that is why the public are appealed to to save all their wastepaper, keep it clean, and separate, for salvage collection. It should not be forgotten that we have in wastepaper a valuable home-produced raw material, but it is scattered in small quantities throughout all the homes of Britain, and an efficient paper salvage system is a great asset to the country's wealth.

Unfortunately there has been a considerable falling off in Municipal salvage collections recently, and they will need to be increased considerably if industry is to be adequately supplied with this important raw material. Every household can help.



The electrical drive of a board-making machine, showing heavy-duty motors and switchgear.



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The "Meteor's" Record

By John W. R. Taylor

DURING the last twelve months there have been many claims, particularly from America, that this or that aeroplane is the fastest in the world. The most effective answer possible was given on the 7th November last, when a Gloster "Meteor" IV of the Royal Air Force flashed over a three kilometre speed course at Herne Bay at an average speed of 606.25 m.p.h. So the world's absolute speed record returned to Britain after 12 years.

For Glosters and for Rolls-Royce, who designed the "Meteor's" "Derwent" jet-engines, the record marks the culmination of more than 20 years of achievement in British air racing. In the early 1920's the little Gloster "Bamel" held the British speed record for four years. The later achievements of the Rolls-Royce-engined Supermarine Schneider Trophy aircraft and the beautiful Gloster Schneider sea-planes are too well known to need mention. For many years they held the world speed record for Britain, until 1933 when an Italian Macchi racer "clocked" 423.57 m.p.h. Italy held the record until 1939 when a specially-constructed Messerschmitt 109R set up a new record of 469.2 m.p.h.—the record so well and truly smashed by the "Meteor" at Herne Bay.

The most significant fact is that the pre-war record-breakers were all specially built for the record attempt, and used engines which were so highly boosted that they were sometimes guaranteed for only five minutes maximum power output. By comparison the "Meteor" is a standard fighter, taken at random from the Gloster assembly line at Brockworth. In fact it is probable that the "Meteors" in service with Fighter Command in six months time will be almost identical with the record machine.

The prototype Gloster F9/40 "Meteor," which flew in March 1943, was fitted with two Rolls-Royce "Welland" jet-engines, developed from Frank Whittle's original design and developing 1,700 lb. thrust each. Apart from the fact that its tail-plane was mounted high up the fin to clear the hot gases from the jet-engines and that its undercarriage was very short as there was no airscrew clearance to worry about, the F9/40 was quite an ordinary-looking twin-engined, single-seat fighter. It had a wing span of 42 ft. 10 in., a length of 41 ft. 4 in. and could fly at nearly 500 m.p.h.

The "Meteor" was put into production for the R.A.F. and, in April 1944, its "Welland" engines were superseded by the newer "Derwent" Is, which developed 300 lb. more thrust. This extra power came in very useful three months later, when the "Meteors" went into action against German V.1s over Southern England—the first, and, as it proved, the only Allied jet-propelled aircraft to be used against the enemy.

By June of this year Rolls-Royce had developed an even better engine, developing twice the power of the "Derwent" I, in other words the equivalent of about 6,500 h.p. at 600 m.p.h. Named "Derwent" Series V, the new engine weighed only 1,200 lbs., compared with the 1,430 lbs. of the 1,280 h.p. "Merlin" XX piston-engine. Rolls-Royce realised that, with this engine, the "Meteor" could smash wide open the existing (*Continued on page 434*)

The Atomic Bomb

Atom Splitting as a Source of Power

THE greatest sensation of the World War undoubtedly was the sudden appearance on the scene of the atomic bomb, a comparatively small affair as bombs go, but capable of destruction to an extent previously undreamed of. It was only the application of atomic energy in warfare that was sudden, however; the atomic bomb had been foreseen, and its successful use followed on concentrated research and hard work by Allied scientists extending over five years.

To understand exactly what the atomic bomb is and does, it is best to go back to the first authentic case of atom splitting, in 1919. By that time it was already well known that the atom, long thought to be the smallest particle of matter that could exist, is in reality built up of still tinier particles, called the proton and the electron, the first of which has a positive electric charge, while the second has a negative one. In the picture that has been formed of a typical atom, the protons, with a number of electrons, are concentrated in a central nucleus, and the rest of the electrons are grouped round it, so that the greater part of the space occupied by the whole atom is empty.

The 90 or more elements that we know are built up of various numbers of protons and electrons distributed in this manner, and most of them, including hydrogen, oxygen, nitrogen, carbon and metals such as lead, tin, copper and iron, seemed then about as permanent as anything could be. A few were known to break up of their own accord, however, shooting out electrified particles and generating a certain amount of heat in the process. The best known of these radioactive elements, as they are called, is radium, and another metal that behaves in a similar way is uranium, a comparatively rare element that until recently has been found useful chiefly for giving glass a yellow colour.

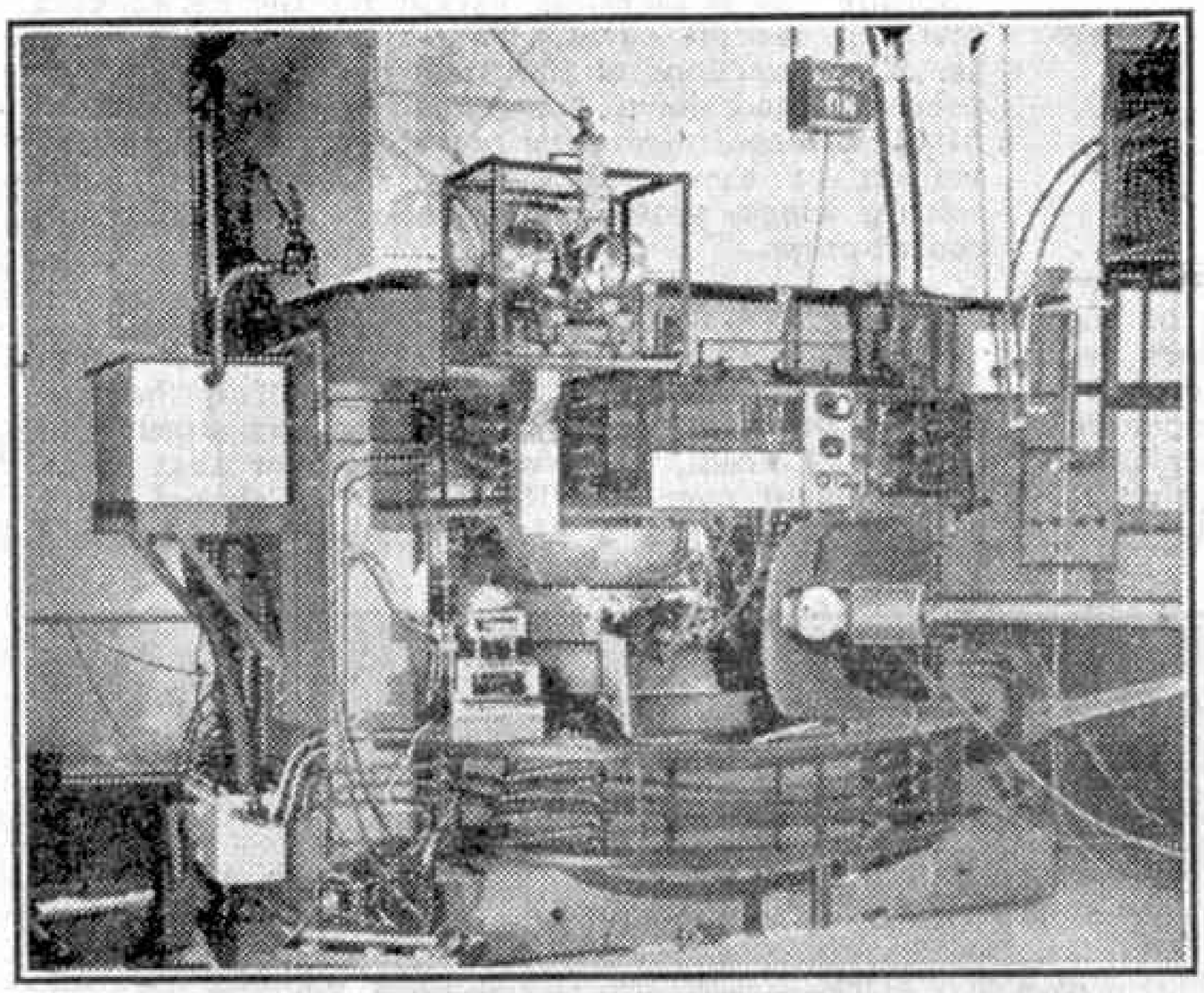
With this in mind efforts were made to break up atoms that were not radioactive, and the first real success came to Lord Rutherford in 1919. The plan that he followed was to shoot charged particles at nitrogen, the well-known gaseous element that forms about four-fifths of the atmosphere. This was a queer kind of shooting match, for, as we have seen, the nitrogen atoms forming the targets are mostly space, and only one in about 45,000 of the tiny particles used as bullets or shells managed to hit the mark, the positive nucleus; the rest passed harmlessly through. The few that did reach their target chipped off pieces of the nitrogen nuclei.

From that time onward efforts at atom splitting became a regular pursuit of scientists. As bullets or shells they used many different kinds of tiny particles, shot out at high speeds from radioactive materials and from other sources, and eventually pressed into this service an entirely new kind of particle discovered in 1932 by Prof. Sir James Chadwick, one of the scientists behind the production of the atomic bomb. This particle is a strange one, for unlike the proton and electron it has no electric charge at all. This makes it the more penetrating, for it can approach the centre of an atom without being electrically repelled, and it was soon found to be extremely effective. The name given to it, one that suggested its lack of electrical charge, was "neutron," and neutrons play a vital part in the explosion of the atomic bomb.

There is no space here to go fully into the various kinds of "guns" used in these atomic bombardments, but two are worthy of special mention. One of them was used by Drs. Cockroft and Walton in 1932. As bullets they used the nuclei of hydrogen atoms, to which they gave tremendous speed by applying very high electric voltages. The nuclei were then shot at the metal lithium, which disintegrated under their attack and was transformed into helium, thus achieving the transmutation dream of the alchemists. The second atomic gun is the cyclotron, developed by Professor Lawrence, an American scientist. In this the charged particles used as bullets are whirled round and round spirally in a narrow channel between two electro-magnets until they attain very high speeds. Cyclotrons are large and costly, and so far few have been constructed. The one we illustrate is at Liverpool University.

Pioneers in atom splitting. In the centre is Lord Rutherford, who first broke up an atom artificially in 1919. On his left is Dr. J. D. Cockroft and on his right Dr. E. S. Walton, who in 1932, transformed the metal lithium into helium by an atom-splitting process.

One reason for the persistence of the atom splitters is that in the process a vast amount of energy is released. In a sense the splitting of any atom is an explosion, for at the moment of disintegration this energy is released at once. In this the action is similar to what happens when a quantity of T.N.T., or trinitrotoluene, is shocked into violent explosion by means of a detonator, for the particles of this explosive are instantaneously broken up, and a large quantity of energy is released that immediately makes its presence known by the terrific roar and blast. In the case of an ordinary explosive the energy released is that holding the constituent atoms together, but when an atom is split the energy set free actually comes from the destruction of a part of the atom itself, and is far greater in proportion



The cyclotron at Liverpool University. This machine gives high speeds to charged particles by whirling them in a spiral course under the influence of two powerful electro-magnets, and the particles are then used for atomic bombardments. Photograph by courtesy of the Physics Department, University of Liverpool.

to the amount of matter involved.

The discovery of some means of splitting atoms and releasing this energy therefore would provide us with a wonderful source of power. The energy that would be derived from a cupful of ordinary water if the atoms in it could be split up would be more than sufficient to drive "*Queen Mary*" across the Atlantic, a task that at present calls for the burning of vast quantities of oil.

At first there seemed little prospect of our ever being able to make use of atomic energy, for the simple reason that more energy had to be put into the splitting process than could be got out of it, while success was only attained in dealing with quantities too minute to be visible. Then all at once an astonishing discovery was made. This concerns the metal uranium, to which we have already referred as a radioactive element. In a series of experiments in which this element was bombarded by neutrons it was found that in the residue there were atoms of barium, which have a weight of about half that of the atoms of uranium. Previous scientific artillery bombardments had merely chipped off tiny bits of various atoms, but here was a case in which a heavy atom actually broke up into two parts of about equal size.

Then the further discovery was made that in the splitting more neutrons are actually set free, shot out of the atom breaking up at speeds comparable to that of the neutrons that brought about the change. In other words, the bullets in this shooting match make others immediately they strike the right targets, and their number is continuously being increased. It was soon seen that shooting a neutron into a mass of uranium would start a chain action. It would break up one atom, and the neutrons then released would be capable of breaking up more; this would continue, and atom splitting would spread like wildfire through the mass, releasing energy on an explosive scale.

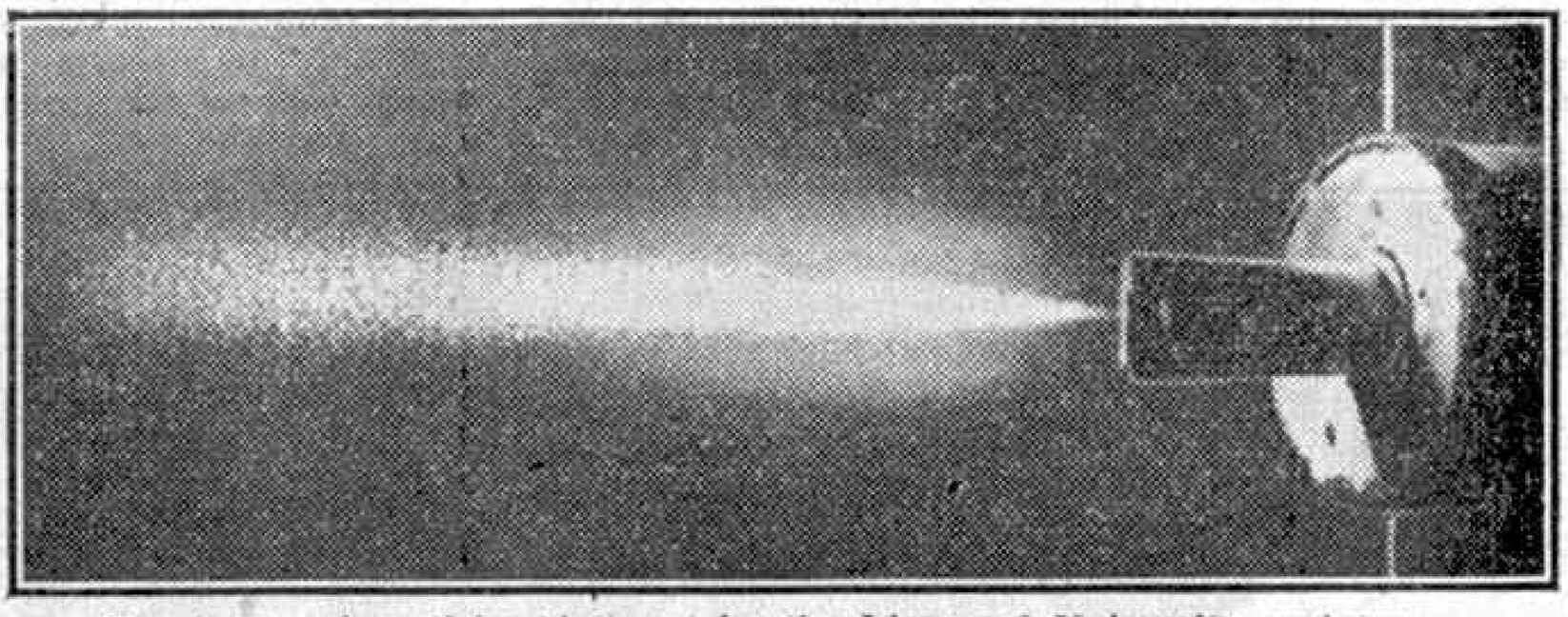
This was rather alarming. It was reassuring to find that uranium itself does not behave in this way, for a form of the metal, an isotope as scientists call it, with an atomic weight of 235 against the 238 of ordinary uranium, was discovered to be responsible. This is usually known as U235, and it is present in the uranium that we know to the extent of little more than half of one per cent. Still the prospect was sufficiently disturbing to make some of the scientists who were carrying out these experiments suspend their activities until they had learned more about it.

This was the position when the war broke out. From that moment there was no news of any developments until the first atomic bomb was exploded over Hiroshima but in the meantime many Allied scientists and industrialists had been secretly at work, and enormous sums of money had been spent in experiments and in erecting plant for the production of atomic bombs.

The first step was to find some way of extracting from uranium the small proportion of U235 that it contains. Isotopes have the same chemical properties, and separating them is a difficult and laborious task. One way of doing it is to give them an electrical charge and shoot them out in a magnetic field, the effect of which is to sort them out according to their masses; but this is a terribly slow way and not easy to adapt to the production of more than minute quantities. The plan was discussed, but a form of diffusion seems to have been used in making the atomic bombs dropped on Japan. This can be used for gases and liquids. How it works is best illustrated by imagining a mixture of the two well-known gases hydrogen and carbon dioxide, the first of which is much lighter than the second. If such a mixture is placed in a porous vessel, made say of unglazed earthenware, both gases will make their way through the pores of the material and escape, but the hydrogen will do this more quickly than the heavier gas, and so the first fraction of the mixture diffused in this way will be richer in hydrogen than the original one.

Then came the task of making the bomb itself. The quantity of U235 to be used had to be worked out carefully, for in a very small amount the chance of the neutrons produced by the breakup of some of the atoms hitting the centres of others is very small and the chain effect would not be produced. Some, if not all, would escape, and the only way to make sure that there would be collisions is to increase that amount of U235. By doing this a critical size is eventually reached when a sufficient proportion of the neutrons produced would be effective in making the atomic break-up spread at high speed throughout the mass.

(*Continued on page 434*)



The beam of particles shot out by the Liverpool University cyclotron.

Air News

More New British Aircraft

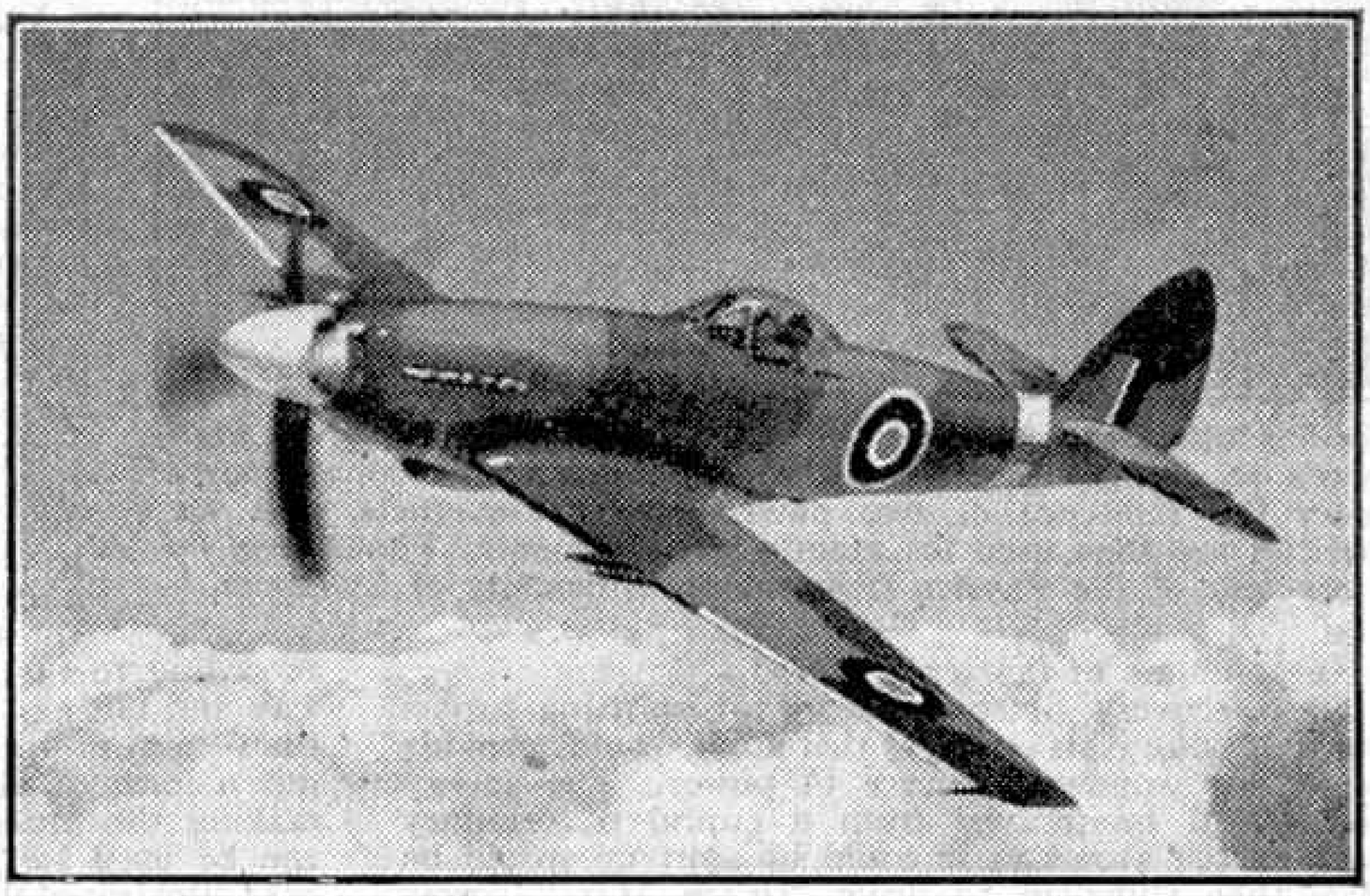
Now that there is no longer any need to conceal from enemy eyes the wartime achievements of the British aircraft industry, many new aeroplanes are being taken off the secret list. They leave no doubt whatsoever that our industry is second-to-none in the world in the design and production of warplanes. Almost every company has at least one new aircraft in hand, and the preponderance of Naval types is convincing proof that Japan would have had a very sticky time in the next twelve months had the war continued.

Vickers-Armstrongs Limited

The Vickers "Spiteful" XIV was developed from the "Spitfire" and has an even better performance—little more need be said. The improved speed and manœuvrability are due largely to the fitting of a new square-cut laminar-flow wing to a fuselage still very reminiscent of the "Spitfire." This wing, which has a span of 35 ft., requires workmanship of an unprecedented accuracy as the aerofoil contours have to be accurate to within five-thousandths of an inch. The extra trouble is well worth while, however, as it gives the "Spiteful" a speed of over 460 m.p.h. Unlike the "Spitfire," its undercarriage folds inward, giving a wide track, more suitable for landing on rough airstrips or carriers. It has a 2,050 h.p. Rolls-Royce "Griffon" engine, is armed with four cannons, and has a range of 530 miles at 260 m.p.h., which puts it into the interceptor class.

There is also a Naval version of this fighter, known as the "Seafang" 31, fitted with folding wings and an arrester hook. It can carry either rockets or three 500 lb. bombs, and has a top speed of 444 m.p.h.

As well as these new fighters, Vickers have produced also improved Marks of the "Spitfire" and "Seafire" powered by "Griffon" 61 engines. The "Spitfire" 21 differs from earlier versions in having a redesigned elliptical laminar-flow wing and an armament of four cannons. It has a top speed of 454 m.p.h. and a maximum range of 880 miles with drop tanks. The "Spitfire" 22 is identical, except for the fitting of a teardrop cockpit cover. The "Seafires" 45 and 46 are Naval versions of the "Spitfires" 21 and 22 respectively and have non-folding wings. Some are fitted with contra-rotating propellers. The production version of these will be the "Seafire" 47 with folding wings, provision for rockets or bombs, and contra-props.



Vickers-Armstrongs Supermarine "Spiteful," which has been developed from the famous "Spitfire." Photograph by courtesy of Vickers-Armstrongs Ltd.

A. V. Roe Limited

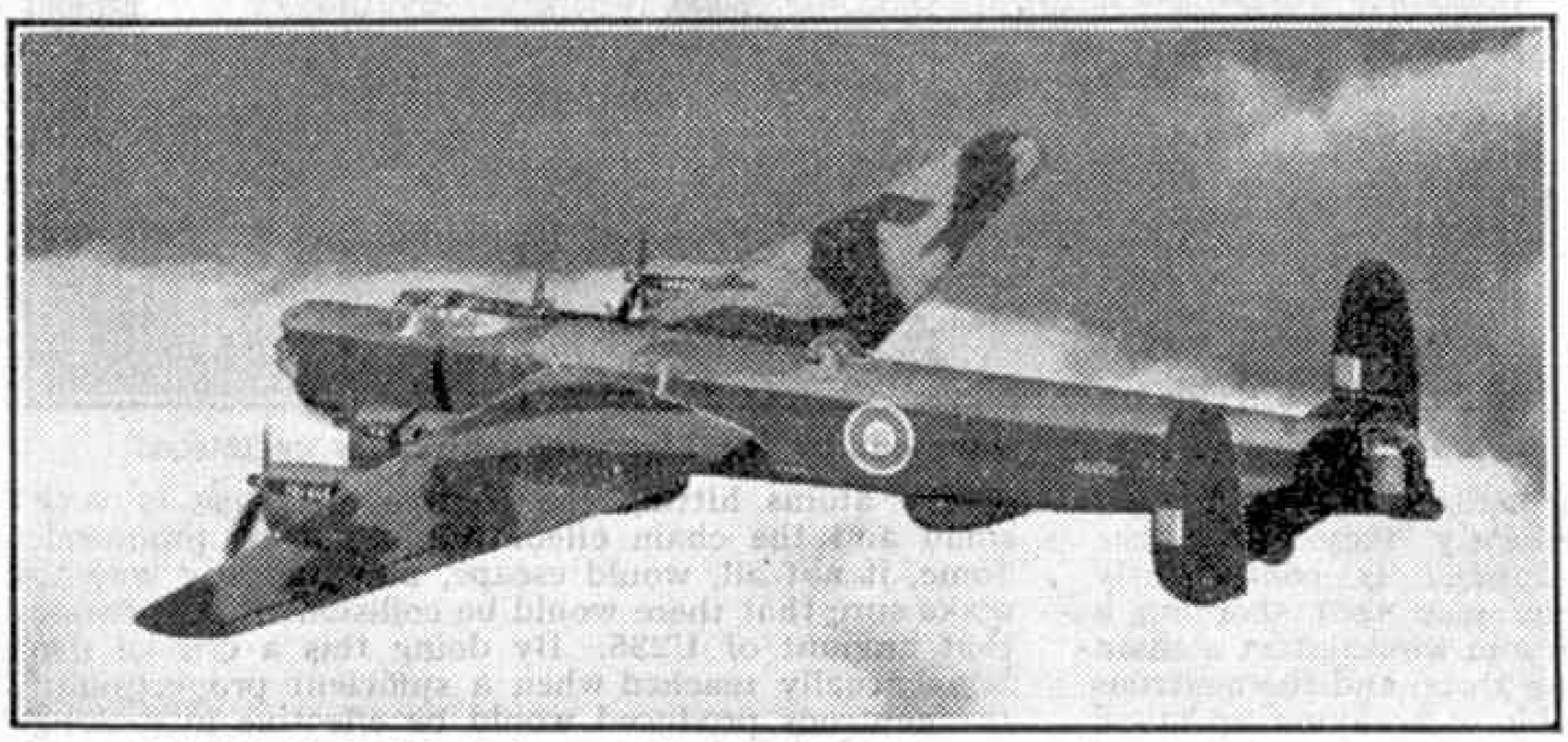
The Avro "Lancaster" has for many years represented the peak of world achievement in bomber design. Now this famous aircraft has been superseded by the "Lincoln," a new Avro bomber that is an improvement over the "Lancaster" in almost every respect. It carries a bigger bomb-load faster and farther, and has a much more formidable defensive armament. Special attention was devoted also to the question of crew comfort, as the new bomber was designed for service in the Pacific theatre where distances are great.

The "Lincoln" is very similar to the "Lancaster" in general appearance, and in fact was originally named "Lancaster" IV. The chief external points of difference are the bigger wing span of 120 ft., the "bay-window" bomb-aimer's position, and the cowling of the 1,750 h.p. "Merlin" 85 engines. Extensive radar equipment is of course carried. To enable the "Lincoln" to operate in daylight without fighter escort, each of its front, upper and rear turrets has two .50 in. machine-guns, and there is also a further "point five" under the fuselage. The dorsal turret can be changed for one housing two 20 mm. cannons if desired.

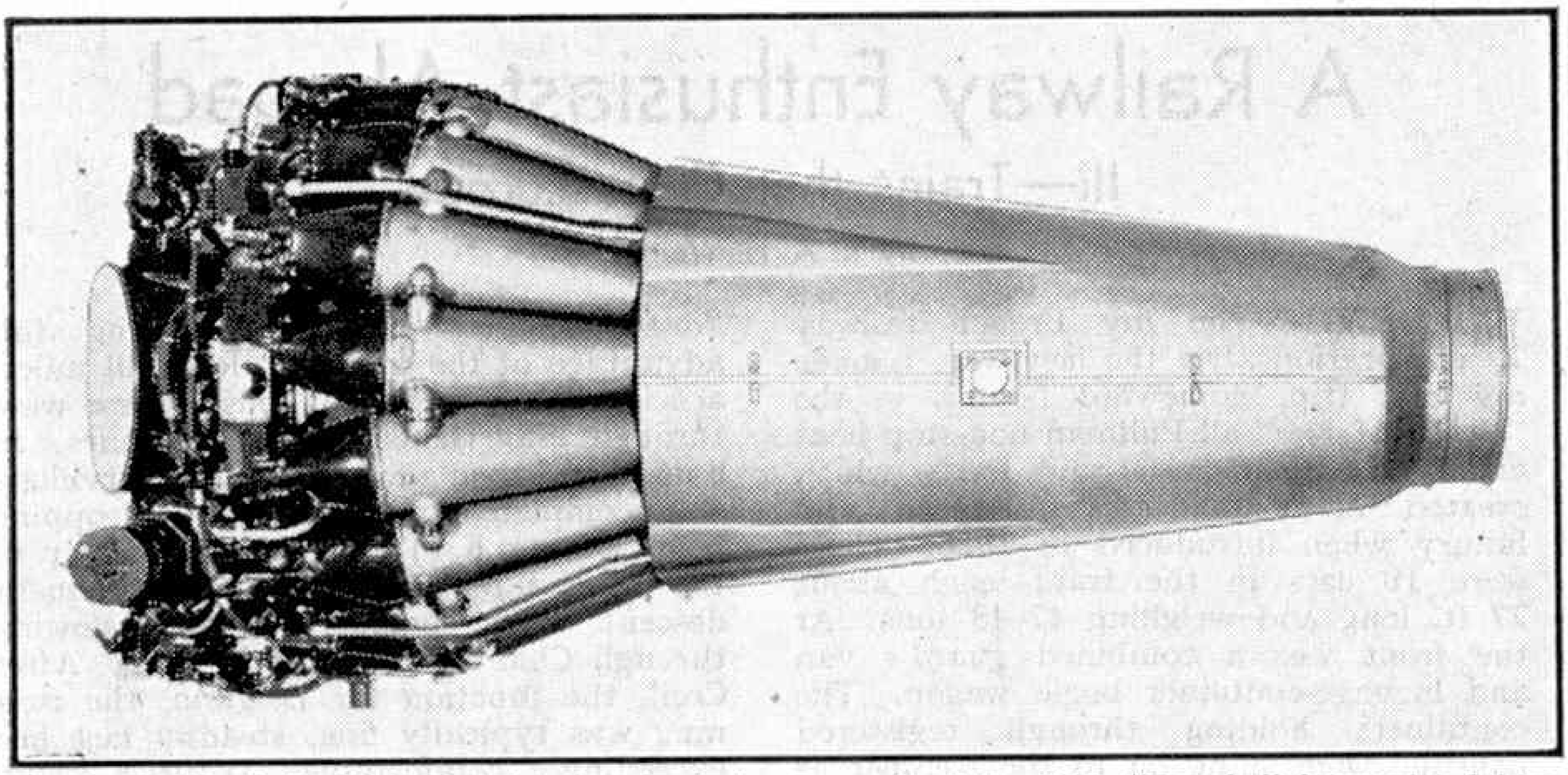
The influence which the design of heavy bombers has had on the development of our Civil Air Fleet is apparent when it is realised that the fine new Avro "Tudor" transport uses what is basically a "Lincoln" wing and engine installation.

Details of other new British aircraft will be given next month.

J.W.R.T



Avro "Lincoln," Britain's largest bomber. Photograph by courtesy of A. V. Roe and Co. Ltd.



The de Havilland "Goblin" Turbojet, the standard power unit of the D.H. "Vampire" interceptor fighter. Photograph by courtesy of The de Havilland Aircraft Co. Ltd.

D.H. "Goblin" Turbine-Jet Unit

In the special article "*Jet-Propelled Fighters*" in last month's "*M.M.*" it was mentioned that the de Havilland "Vampire" interceptor fighter is fitted with the "Goblin" jet engine developed by that company, and we are now able to illustrate this interesting engine, which is shown above.

The "Goblin" is a simple engine with straight-through gas flow and single-side centrifugal compressor. Built in the "Gipsy"-engine tradition, it has already run 500 hrs. under official type-test conditions without change of any main component. It was the first turbine successfully to pass the official type-approval test for aircraft. At its present quantity-production rating of 3,000 lb. thrust the "Goblin" gives the "Vampire" a normal top speed of 540 m.p.h. This is the sustained level speed of the standard "Vampire" combat aircraft with comprehensive military load, armament, and full operational endurance and engine overhaul periods. Much higher speeds are attained in current development work.

More Record Transatlantic Flights

A new record for the fastest West-to-East transatlantic flight was achieved on 23rd October last by a R.A.F. "Mosquito" PR Mk. 34 of Coastal Command, which flew from Gander, Newfoundland, to St. Mawgan, near Newquay, Cornwall, in 5 hrs. 10 min., an average speed of 445 m.p.h. The machine was helped by a very strong tail wind.

The same "Mosquito" had made a record East-to-West transatlantic flight on 8th September last. On that occasion it flew from St. Mawgan to Torbay, Newfoundland, a distance of 2,300 statute miles, in 6 hrs. 58 min., averaging 330 m.p.h. This was not much more than half the previous record time for a transatlantic flight in this direction.

New Aircraft for Railway Air Services

Railway Air Services have been experimenting on various routes with the Avro XIX, the civil version of the well-known "Anson" which performed such useful work with the R.A.F. during the war. The XIX is a 7–9 seater low wing monoplane, and cruises at 155 m.p.h. The company have ordered several of these machines to supplement their fleet of D.H.86s and D.H.89 "Rapides," and immediately on delivery they will go into service on the London-Belfast and Glasgow-Belfast routes. Plans are in hand also for using the Avro XIXs on a proposed direct London-Belfast air service, taking a little over two hours.

The company have also ordered some Vickers "Viking" twin-engined transports, and delivery of the first of these 21-seater machines is expected early next year.

Over 100 Lockheed "Constellations" Ordered

Rapid and orderly conversion from war-time to peace-time production has enabled the Lockheed Aircraft Corporation, U.S.A., to make a good start in producing the 103 "Constellation" air liners already on order. Five major U.S. airline companies have ordered machines of this type, and orders for them have been received also from Royal Dutch Airlines, Royal Netherlands Indies Airlines, and from the French Government.

The "Constellation" is a 4-engined transport, with a wing span of 123 ft. and a tail unit that includes triple fins and rudders. The long sleek fuselage has a capacity of 48 to 64 passengers. The machine can fly at over 340 m.p.h., and cruises at a speed that makes possible a 10 hr. service between California and New York.

Fast Trans-Australia Flights

The "Liberator" which made the opening flight of R.A.F. Transport Command's Delhi-Sydney air service broke the air record from Perth to Sydney by covering the distance of 2,100 miles non-stop in 9½ hrs.

The following day a "Lancastrian" mail plane of Quantas Empire Airways, operating on the regular England-Australia air service, made the crossing from West to East in 8 hrs. 57 min. It departed from Exmouth Gulf, which is some distance north of Perth, and flew non-stop to Sydney, a distance of 2,406 miles. Although its flight was 300 miles longer the "Quantas" machine clipped about 30 min. off the "Liberator's" flight time, the actual flying time of the "Lancastrian" being 8 hrs. 43 min. "Chock to chock" time, which is from "motors on" at the start to "motors off" at the destination, was 14 min. longer.

World's Largest Helicopter

The PV-3 twin-rotor helicopter built for the U.S. Navy Bureau of Aeronautics has a fuselage 48 ft. long and 13 ft. high, and is claimed to be the largest helicopter in the world. It can carry 10 passengers and a crew of two on medium-range flights. The PV-3 is a weird-looking machine, with a fuselage that curves upward at each end and is surmounted at each end by a three-bladed rotor. A 100 ft. dia. clearing is necessary for its operation.

A Railway Enthusiast Abroad

III—Trains that Cross Europe

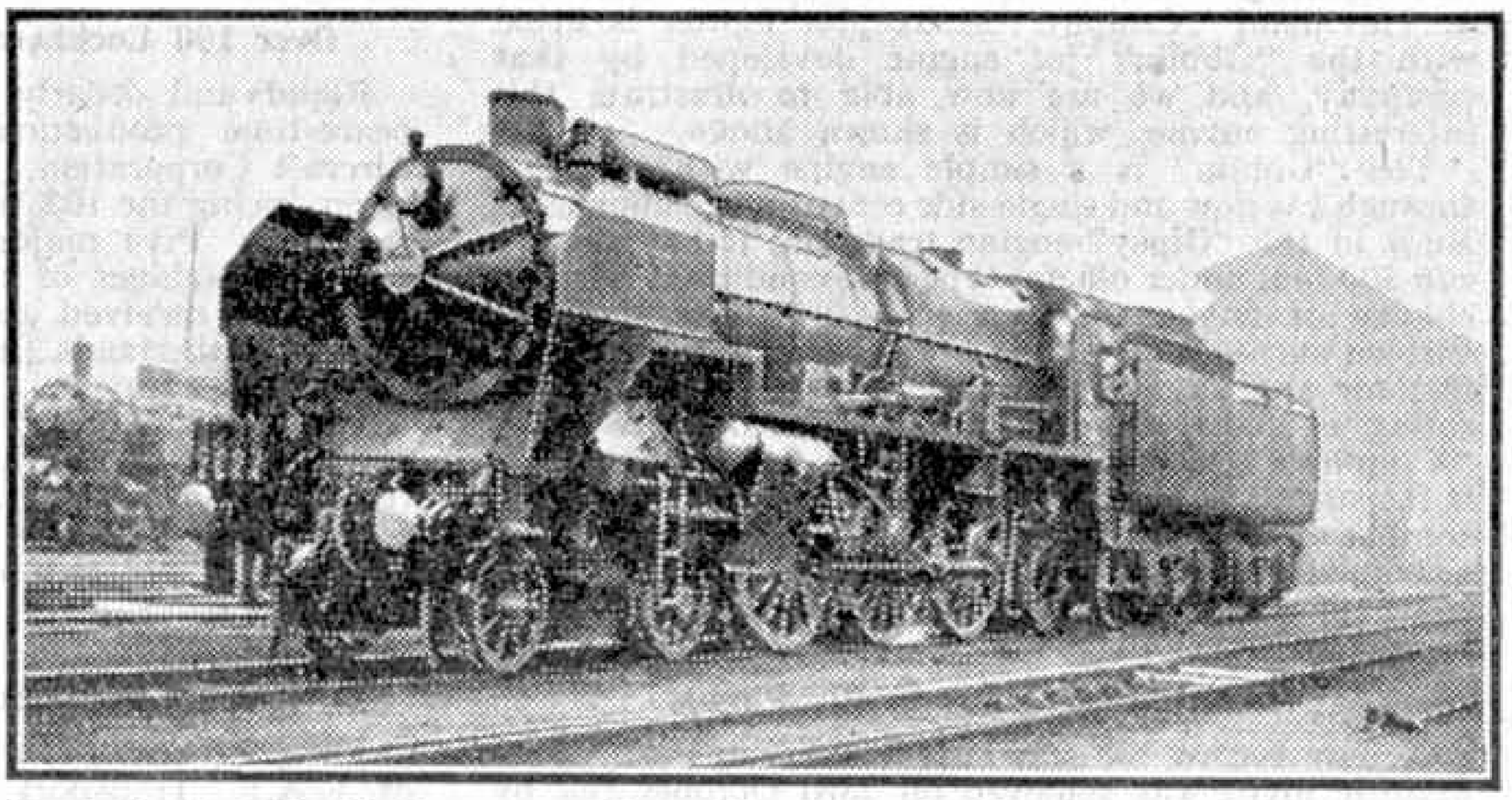
By R. A. H. Weight

FOLLOWING on my French railway exploration after the last war, I made my first trip, homeward bound, in the "*Golden Arrow*" all-Pullman non-stop boat express between Calais and Paris, which created new standards of speed and luxury when introduced in 1926. There were 10 cars in the train, each about 77 ft. long and weighing 47–48 tons. At the front was a combined guard's van and luggage-container bogie wagon. The containers holding through registered baggage were slung on to the steamer at Calais, and off again at Dover, on to the open truck attached to the S.R. boat train. They were sealed before leaving Paris and opened for examination only after arrival at Victoria.

In the train itself a goodly number of the armchair seats were occupied, but the increase on the tare weight of 501 tons to allow for passengers, luggage, staff and stores would not have been more than 14 tons, so that the gross load behind the tender was 515 tons. This was heavy in view of the fact that the through timing over the 184¼ miles to Calais Pier allowed only 190 min., an average of over 58 m.p.h. The locomotive was No. 3–1218, a Nord "super-Pacific" of the first series. In this number the prefix "3" means that the engine had three pairs of driving wheels, and in fact was a six-coupled engine. The numbers of four-coupled engines on that line were prefixed by "2" and those of eight-coupled engines by "4."

Many readers will remember the graphic description by "*Railway Engineer*" a few years ago of the remarkable four-cylinder compound Nord "Pacifics" and their performance as observed from the footplate. An inspector was riding on the engine on the occasion of my run, which started a minute late owing to some slack through Amiens, being reeled off at an average of 70 m.p.h. There was a slight relaying check just before the summit of the 1 in 133 rise to Neufchatel, reducing speed to 40. Nevertheless when the "*Golden Arrow*" passed round the outskirts of Boulogne, 158 miles had been covered in 156¾ min. and the train was on time.

Now came the hardest climb of the route, over the high downlands leading to Cap Grisnez on the coast, 4½ miles up at 1 in 125. This was taken easily, the minimum being 36 m.p.h., and was followed by a descent on the other side at 60–65. After passing Calais Town station gently, the Pullman drew cautiously along

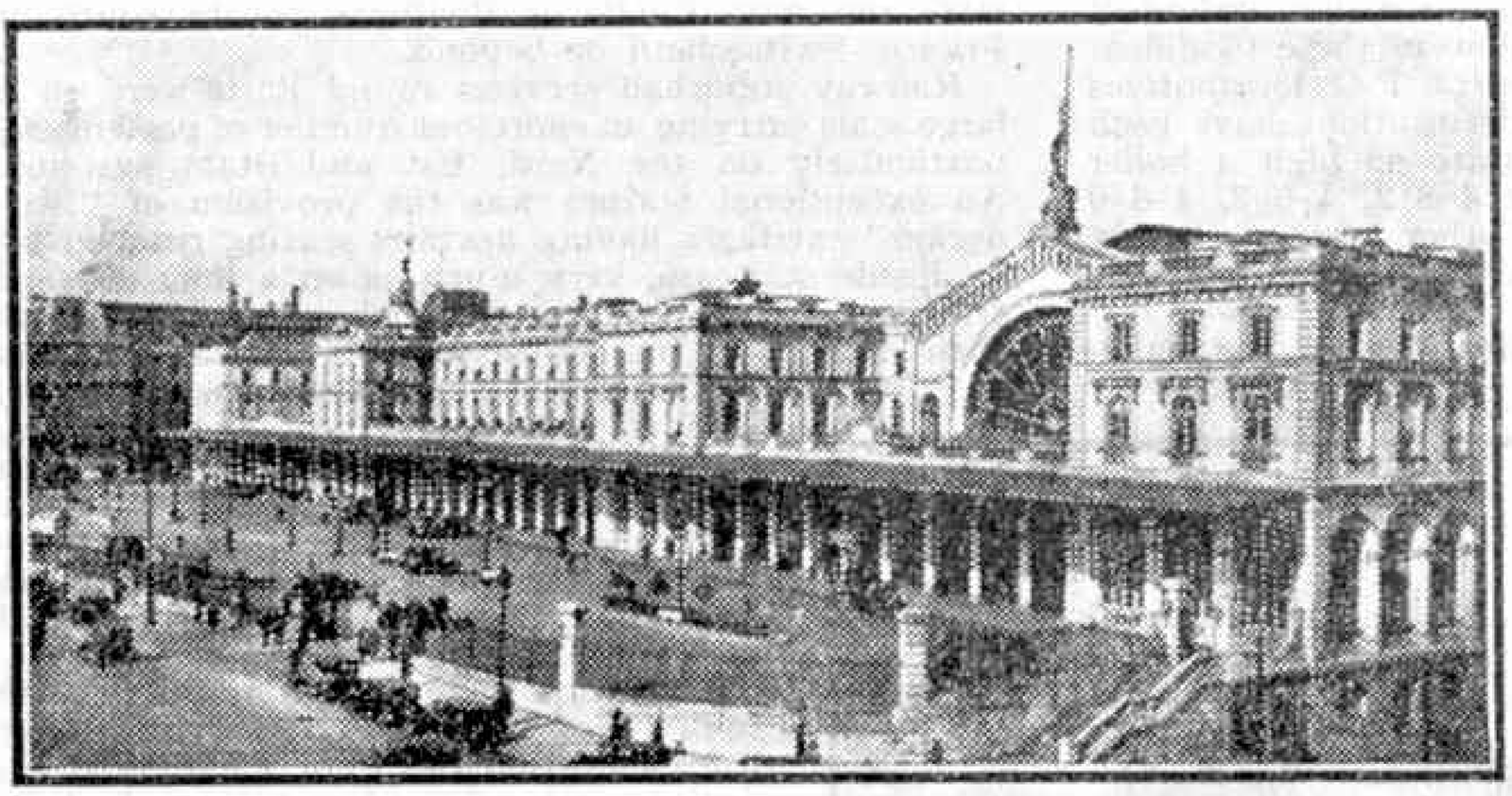


Nord 4-cyl. "Pacific" compound working an English boat train from Paris. Photograph by O. S. Nock.

the "dead centre" difficulty. Taking full advantage of the first few downhill miles, acceleration was tremendous, as we were through St. Denis, nearly 4 miles, in 6 min., and then a long ascent to Survilliers was completed without speed dropping below 56 m.p.h. Just as we had got up to the 70 m.p.h. mark on the subsequent descent there came a severe slowing through Chantilly, costing 3½ min. After Creil, the junction for Belgium, the running was typically fine, steadily fast but exceedingly comfortable. While a really excellent lunch was served in true French style, 100 miles were covered in 94 min., the 24 miles from Gannes summit to Longeau, preceding the severe service

to a final stop at the Harbour exactly to time in 189 min.

Allowing for out of course delays the net time was almost exactly even, 184¼ miles in 184½ min. with 515 tons, equalling some of the best "*Cornish Riviera*" G.W.R. achievements in summer between Paddington and Exeter. The northbound "*Golden Arrow*" subsequently terminated at Boulogne in connection with an S.R. steamer to Folkestone.

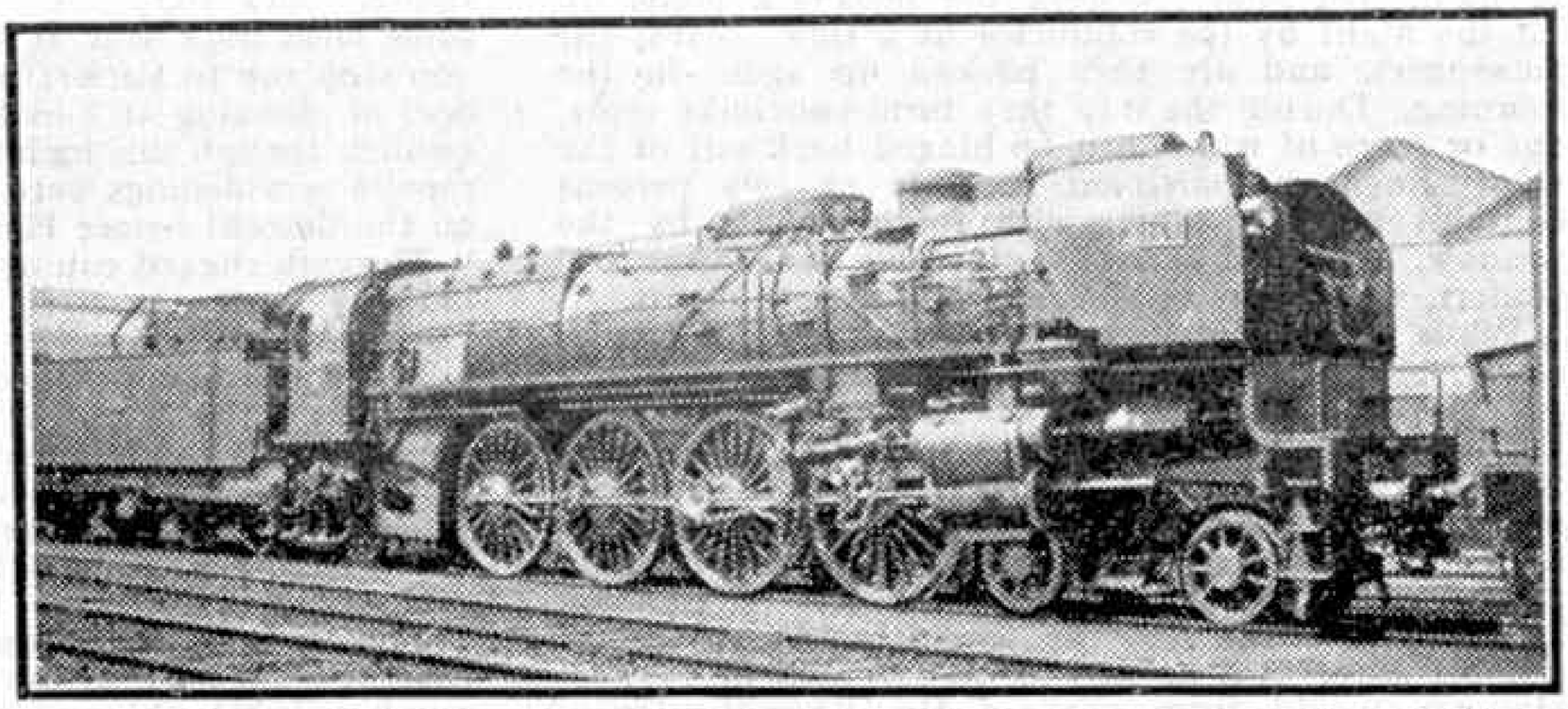


The fine frontage of the Est Terminus in Paris.

The quickest express I sampled on the English boat train service was the 4.40 p.m. Paris to Boulogne, worked by a similar "Pacific," No. 3–1215, built in 1923 and stationed at Calais. By the way, most French, German and other Continental locomotives have the shed or district to which they are attached painted on the cab side. The coaches of the boat train were all of the latest Nord all-steel type, to which was added baggage and guard's van in front, while in the rear was a restaurant car in the varnished teak livery of the International Sleeping Car and European Express Trains Company. The gross weight behind the tender, which itself weighs over 70 tons loaded, was 350 tons, and the allowance for the 157½ miles to Boulogne Town was 154 min., but for part of the year this included a stop at Etaples, near the coast, 17 miles short of Boulogne. When this stop was made an average of 63.4 m.p.h. was required, as only 132 min. were allowed for the 140½ miles Paris-Etaples, a similar timing to that of the L.N.E.R. "*Scarborough Flier*", or the L.M.S. up evening Liverpool diner from Crewe to Euston.

One of those splendid climbs at which big French compounds excel was the compassing of the 12-mile 1 in 200 rise to Survilliers at an average of 60 m.p.h., with a minimum of 58½ and a maximum of 62. At the reduced speed of 50 we were through Creil Junction, 31¼ miles in barely 31 min., next completing the lesser rise to Gannes at a minimum of 62½; then after steady spurts of 75 we crawled through Amiens, 81 miles in 77¼ min., soon picking up speed again along the Somme valley. There were no Etaples passengers, so the stop was cancelled, though it could easily have been achieved, as we sailed through on the middle road at 60 with 20 sec. to spare on the 132 min. allowance, the engine by then having been decidedly eased. Boulogne was reached after a signal check in 152¾ min., 1¼ min. early.

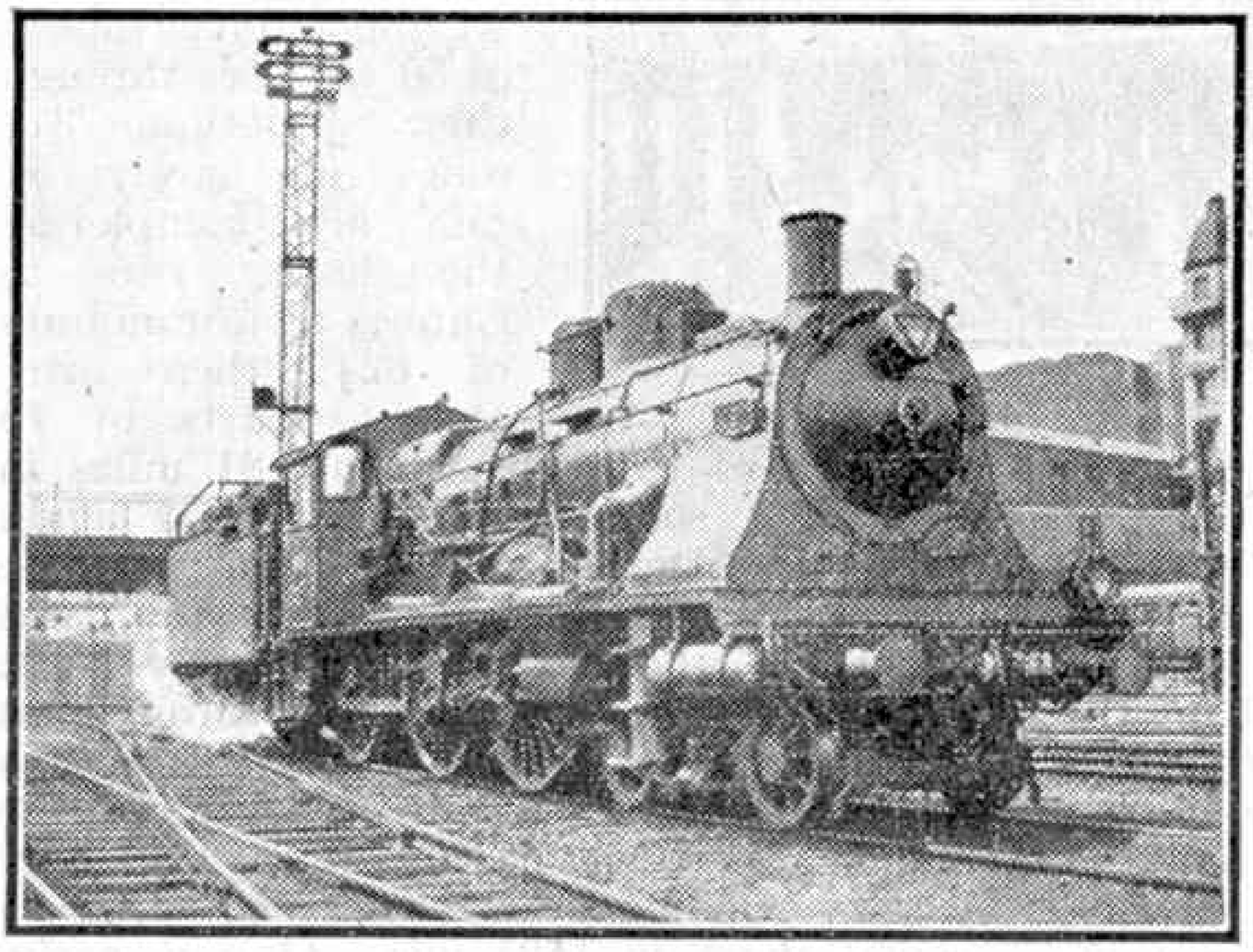
Along certain sections of French main lines, equipped with automatic signalling, speeds up to the equivalent of 87 m.p.h. were latterly permitted for certain trains formed of all-steel stock, though I had no opportunity of travelling by one. High speeds were also attained by diesel railcars. The normal restriction of 75 m.p.h. was waived for special runs on the Nord



Est 4-8-2 No. 241-011 after working a Paris-Belfort express. Photograph by O. S. Nock.

line, such as the memorable occasion when a Paris-Orleans 4–8–0 compound, with driving wheels only 6 ft. 1 in. in diameter, hauling 635 tons and driven hard, averaged 72 m.p.h. between Calais and Amiens, start to stop, including the 1 in 125 Caffiers Bank. This special then attained 73 m.p.h. from the Amiens restart to the outskirts of Paris, where it was run into sidings, having touched 90 m.p.h. The powerful locomotive concerned had been rebuilt with 290 lb. per sq. in. boiler pressure, Kylchap blast pipe and double chimney, and alterations to valves, cylinders and steam pipes. So successful were these modifications on this and other types of P-O locomotives that similar rebuildings or modernisations have been effected, without necessarily quite so high a boiler pressure, in the case of many 4–8–2, 4–6–2, 4–6–0 and 4–4–2 express engines on other systems, nearly all of which embody the locally popular four-cylinder compound form of propulsion.

Next time I was on the "*Golden Arrow*," the make-up was baggage truck, five 1st and 2nd class Pullmans and four of the International Company's latest style blue sleeping cars. The last-named are remarkable vehicles completely equipped for night or day travel in various climates. The cars that ran between Dover and Victoria on the through London-Paris train ferry service were specially built with shortened outside dimensions, but even so they weighed 55 tons each. Some of the full scale cars running abroad weigh about 60 tons, and so are a tough proposition to haul. On long journeys the beds are made up for the night by the conductor at a time to suit the passengers, and are then packed up again in the morning. During the day they form couchlike seats, one or more of which can be hinged back out of the way. Each compartment for one or two persons contains a small table, with folding seats by the window, cupboard, mirror, adjustable ventilators and heaters, washbasin and other useful appointments.



Est 4-6-0 No. 3168, with widened front and casing. Photograph by O. S. Nock.

While the "super-Pacific" was eating up the miles after Abbeville, I had a walk through the cars before tea and spoke to the conductors who went right through on very long journeys. One was bound for San Remo, just over the Italian border from the south coast of France, a 23-hr. trip via Marseilles and Nice; and another for Trieste at the head of the Adriatic, reached in 27 hrs. by way of the Simplon Tunnel and Milan. To my astonishment, attendant number three said he was off to Istanbul in Turkey! His car would form part of the "*Simplon-Orient Express*," a daily train-de-luxe passing through France, Switzerland, Italy, Yugoslavia, Bulgaria and Turkey, and also conveying cars for Roumania and Greece, a through single journey taking three days. The Trieste car would go on the same train as far as that city. On arrival in Paris after a good 58½ m.p.h. non-stop run, these sleeping cars were detached from the rear by an eight-coupled Nord tank and run over the Petite Ceinture to the big P.L.M. terminus, there to await formation into one or other of the many long-distance night expresses to the south. At busy times, complete trains of sleeping and ordinary cars were run from Calais or Boulogne to the south of France, Switzerland or beyond.

Railway suburban services round Paris were on a large scale carrying an enormous number of passengers, particularly on the Nord, Est and State systems. An exceptional feature was the provision of "two-decker" carriages having upstairs seating reached by an inside staircase, very much as on a long covered tramcar. These coaches also had standing room at their ends or in the centre or both, just as on Paris Metro. trains and Continental trams. Besides crowding into such spaces, passengers sometimes perched on the footboards and clung to end doors or handrails at the busiest times! Fortunately the clearances between tracks or lineside erections were fairly liberal and there were no tunnels.

There are many large multi-wheeled tank engines in France and other European countries. For Paris suburban duties the Nord used to employ British-built inside-cylindered 4–6–4Ts originally intended for Holland. Afterwards powerful French 2–8–2Ts were seen working trains of seven steel single-deck, centre gangway coaches, provided with two sets of side entrance doors, on the "push-and-pull" principle, the engine remaining coupled at one end to avoid running round at termini. The driver rode at the front when the engine was pushing, controls being connected through to the footplate. Other interesting developments included experimental high-powered locomotives, railcars and some electrification.

On the Est main line in autumn and winter the principal morning express left Paris at the early hour of 7 a.m. with through carriages to Vienna, Bucharest and Milan via Alsace-Lorraine and Switzerland; it had a fast timing.. With a load of 300 tons, No. 3267, one of the older black four-cylinder compound 4–6–0s of typical Continental design, had to go cautiously owing to fog through the suburban labyrinths, and then suffered a bad permanent way slack on a 1 in 166 rising gradient 12 miles out, so losing 4½ min. Thereafter all was clear to Troyes, though there was a good deal of uphill work. The first 103½ miles took 107¾ min., though only 103¼ net. Another locomotive of the same class took over at Troyes, to make a 171¾-mile non-stop run to Belfort in 182 min., including a good deal of climbing at 1 in 166. Actually 189 min. were needed, though this included two long slowings where repairs or widenings were in progress, and a bad check on the descent before Hortes.

Through rugged country from Belfort into Switzerland at Basle the train ran on the French Alsace-Lorraine Railway, where signals and operating rules followed German practice, so that trains passed one another on the left. The A-L locomotive was a dark green 4–6–2, and some ex-German 2–10–0 mixed traffic engines were about as well as French ones. On the corresponding return express, weighing 355 tons, a couple of 4–8–2 "Mountain" four-cylinder compounds hauled the train, one from Belfort to Troyes and the other from Troyes to Paris, and had time in hand most of the way. These fine engines are numbered 241 011 and so on, the first three figures indicating the number of axles in each series of engine wheels, which of course is half the number of wheels.

Signal Sighting

By "Shed Superintendent"

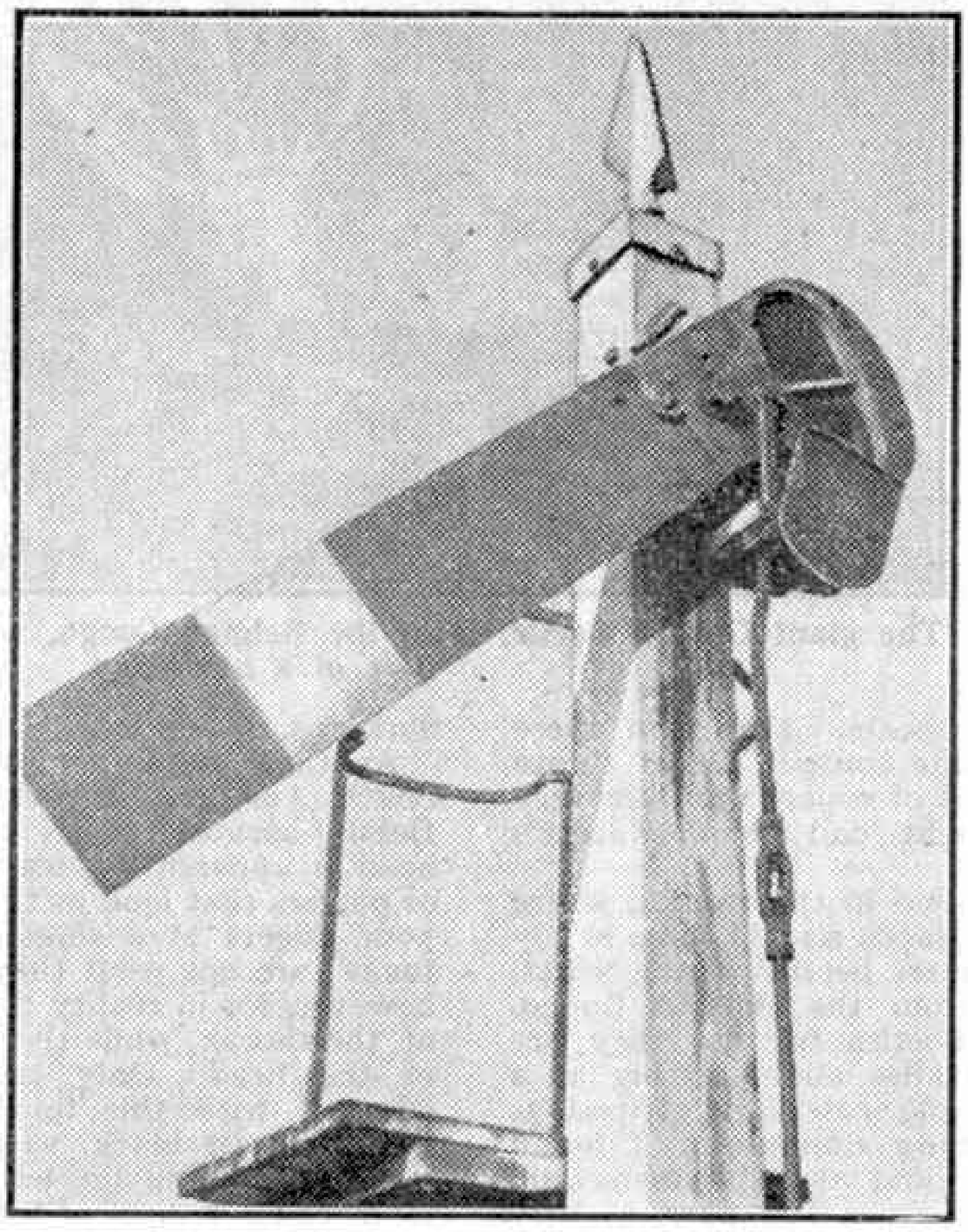
DURING my time as an Inspector it was a pleasant task on a fine day to go out Signal Sighting. When a signal is to be re-positioned for any reason, such as alterations to the layout, the Inspectors from the Locomotive, Traffic and Signal Departments are responsible for deciding the best position and height of the new signal. To do this they meet on the site and consider the speed of the trains, the curvature of the line, obstructions such as trees, and the background against which the signal will appear to the drivers.

A periscope is used to obtain the view that would be seen from the height of the footplate, and observations are made at various distances when walking down the line towards the signal.

Distant signals on fast-running stretches of line are set as far from the Home signal as practicable, one thousand yards being the desirable minimum. Although in clear weather a driver might see a Distant from half a mile away, making a total of over a mile from the Home signal, it must for safety be assumed that the driver does not observe it until he reaches it, as would be the case in bad weather. A "tight" section, where the Distant is rather close to the Home signal, puts a definite limit on the speed of trains, as the drivers know they have no margin in which to make a rapid stop. In suburban areas, where speeds are low, it does not matter so much.

The position of Home signals is naturally fixed by the junctions or stations which they protect, and the problem is usually that of making the signal stand out against a confused background of buildings. White background boards are very effective, and avoid those high signals which look so nice but are so difficult to look after. Ask the lampboy!

Colour light signals are excellent except when the Sun is low and directly behind the signal, when the sunlight "swamps" the colour indication. Owing to the seasonal variation of the position of the Sun, drivers may complain of bad visibility at a certain time of day in a certain month of the year. This must be allowed for when positioning the signal. In one case the rising Sun struck through an archway behind the signal, and the trouble lasted only for a few minutes on an early autumn morning. Several years elapsed before any complaint was made about the signal, as the phenomenon occurred at such infrequent intervals.



The signal is "off."

A further problem arises with the transition from a semaphore-signalled section to a colour-light area. Care is taken to increase the intensity of the oil-burning semaphore lamps at such places, and on the Southern Railway the last semaphore is duplicated by a colour-light unit on the same post.

Signal sighting may be carried out at night in urban areas where street lights or floodlights are liable to confuse drivers looking for a particular signal. The increased use of neon lights for advertising was becoming a nuisance before the war, and signs near the railway often had to be specially screened. I remember seeing a newly-erected neon sign which appeared just behind the Home signal at a well-known junction, and the impression from the engine was, as the driver said: "All the colours of the rainbow and fifty signals at once!"

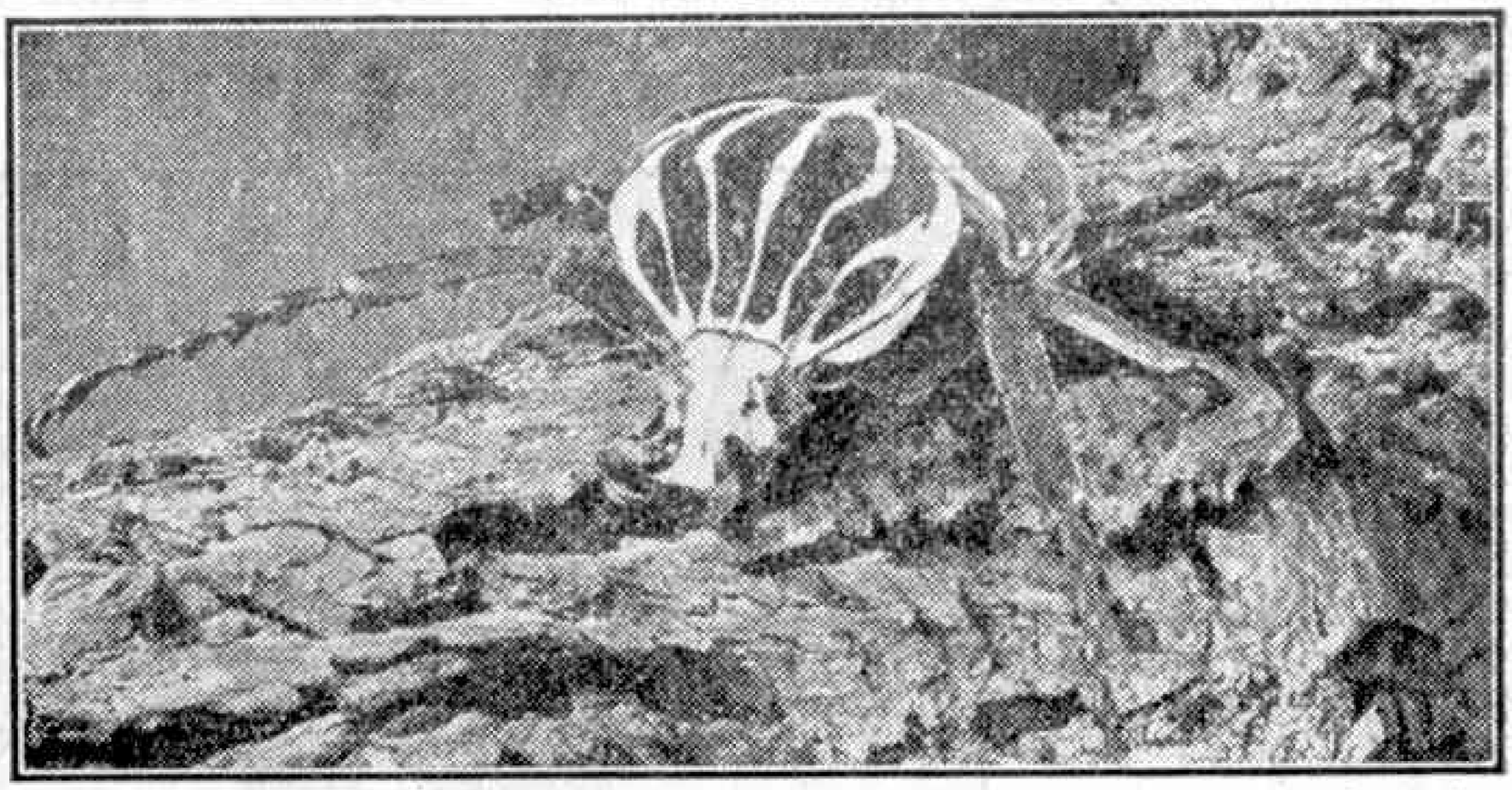
Wonderful Beetles of the Tropics

By L. Hugh Newman, F.R.E.S.

IT is estimated that there are more than 150,000 beetles in the world that have been named and classified. Now you can imagine that among such a terrific number there is a tremendous amount of difference in shape, size and of course colour, so that they fit into every conceivable condition of life, because wherever you go in this world you will find beetles.

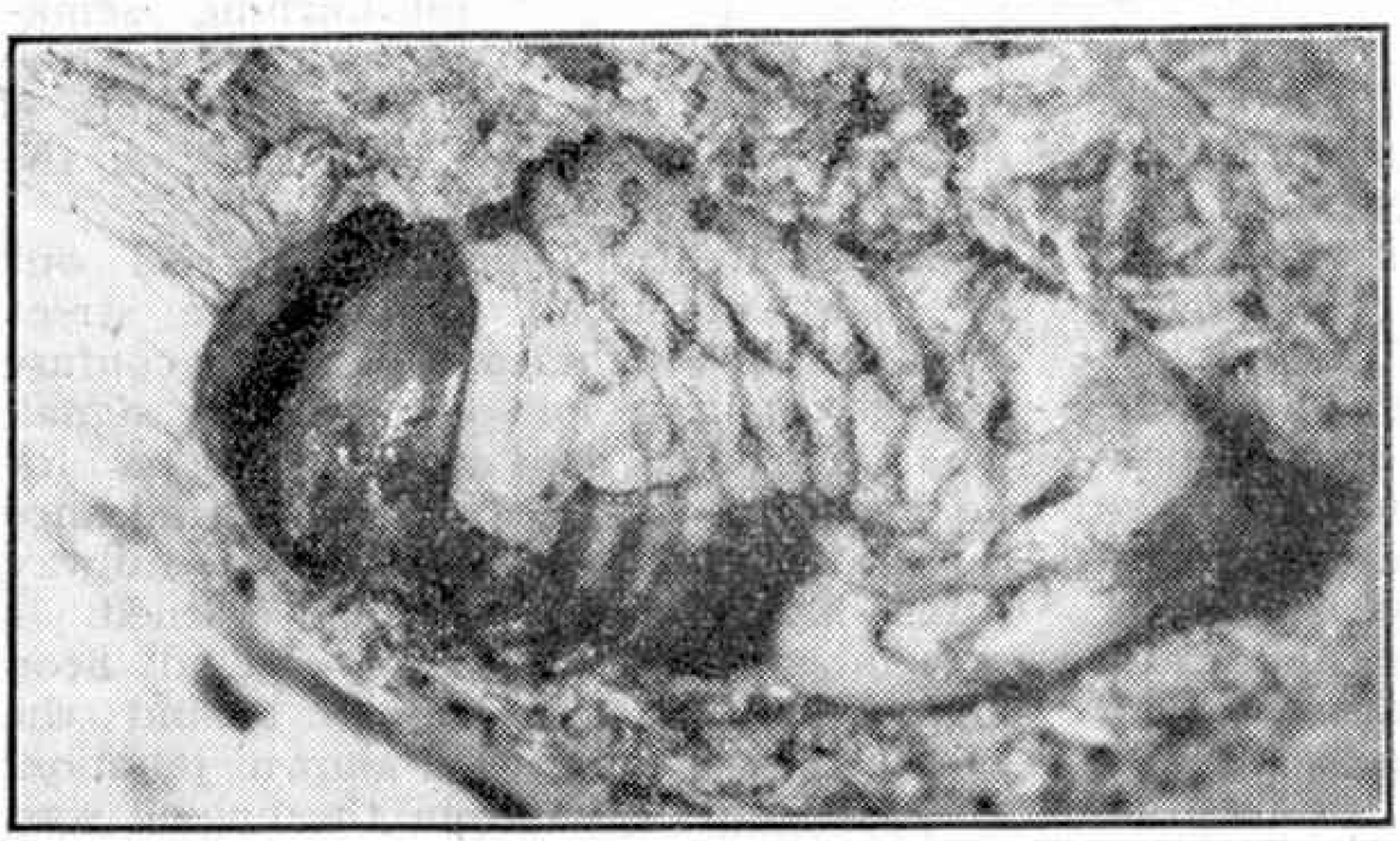
In the British Isles alone there are some 3,500 different species and they have all got one thing in common, that is their cycle of development or life history. The female beetle lays eggs that hatch into little grubs, and when they are full grown they pupate, just as a caterpillar does. In due course from out of the pupa case crawls a full grown beetle. But unlike caterpillars, beetle grubs do not always feed on plants. Some of them are vegetarians, eating leaves or the wood and bark of trees, but there are others that are definitely carnivorous, and catch and eat other insects. And then there are a lot more that are quite content to eat things that are dead or rotten, and of course they are very useful scavengers—one might call them Nature's dustmen!

The largest beetles are found in the tropics, where everything grows to an enormous size. I have in my possession a pair of the largest beetles in the world, which were sent to me from the Belgian Congo. They are called Goliath Beetles because they are such giants. They have bodies about as big as a hen's egg and the dark wing cases are striped as though painted with gleaming aluminium. I found it extremely difficult to mount the specimens and stretch out their wings in the usual manner, as they were tough and leathery, more like the wings of a bat than an insect. The larger of the two, the male, measures just under eight inches across when fully expanded. I have been told that they only fly at night like moths, and are very strongly attracted by a bright light; they can be a great nuisance crashing into lamp glasses and breaking them, or knocking over a lighted candle and plunging a room into darkness.



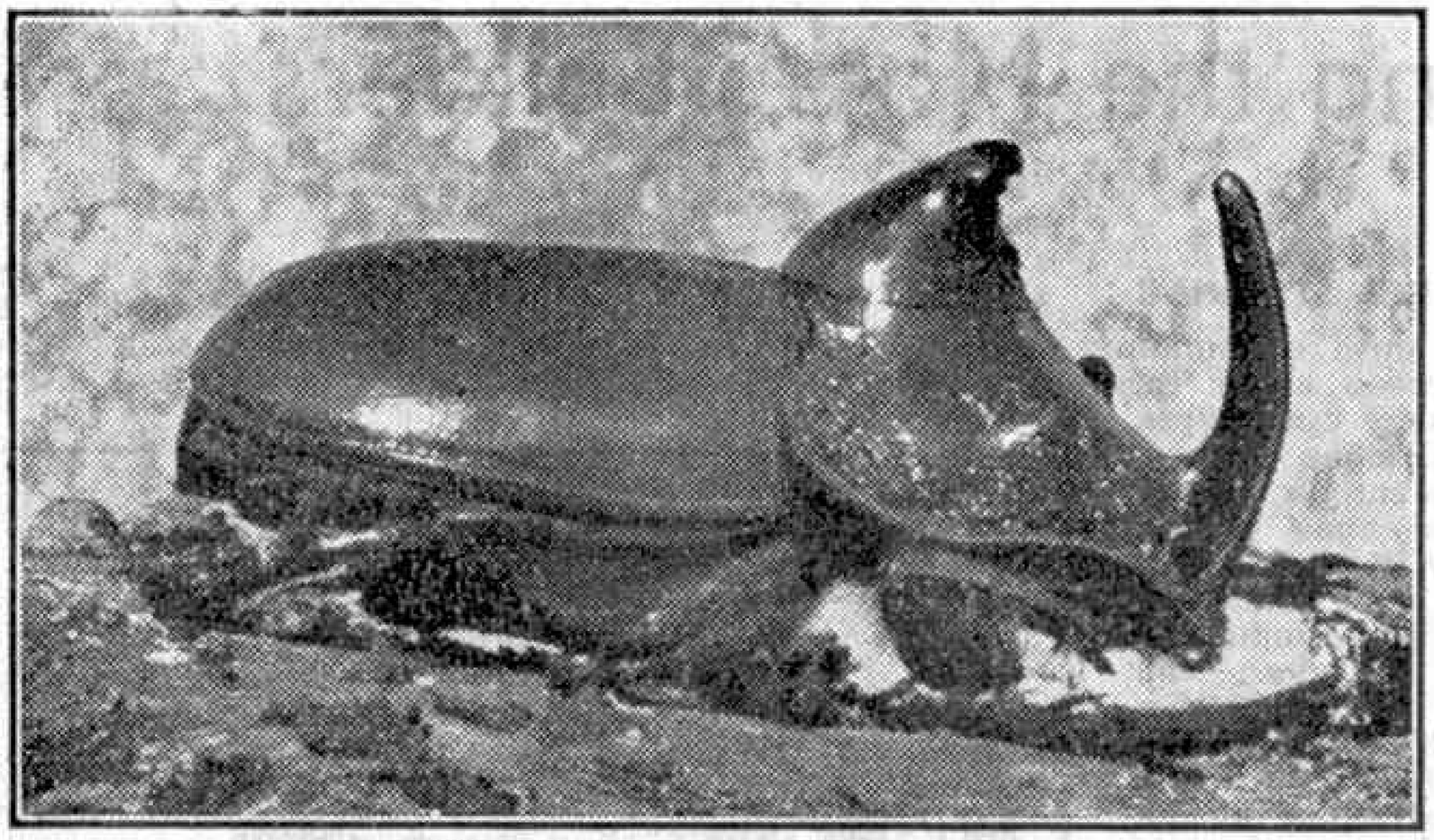
The giant Goliath Beetle, from the Belgian Congo, which has a body about the size of a hen's egg.

Another giant among the beetles comes from South America. It has been named the Hercules Beetle because of its extraordinary strength. Its head is apparently furnished with an enormous pair of pincers that look as though they could cut through your fingers at a single snap. These "blacksmith's tongs" are not what they appear to be at first sight, however, for in reality the upper claw is an extension of the thorax, while the lower claw is a continuation of the head. Only the male Hercules Beetle is adorned with this fantastic decoration. Both the horns are jet black, with a high gloss like cellulose paint, and along the under surface of the upper one is a thick fringe of short, chestnut brown hairs. The actual use of these hairs is unknown, but they may be some kind of sensory organ.



Caterpillars of the Giant Stag Beetle. South American natives eat the larvae of giant beetles.

Although in most museum specimens, and in the accompanying photograph of this giant beetle, no wings are visible, hidden under the gray-green elytra or hard wing cases is a pair of wide and powerful wings. Without these so bulky an insect could not circle high up among the tree tops of the jungle terrain they inhabit, while searching for food or their mates. Not very much is known about its habits, but it has been asserted that it is capable of sawing off small branches of trees by grasping them between the elongated head and thorax, and flying round and round in circles until the branches drop to the ground. We know that they are very fond of gummy juices that exude from freshly wounded tree trunks,



The Giant Rhinoceros Beetle.

and it may be that their extraordinary "implements" assist them in some way in obtaining this nourishment.

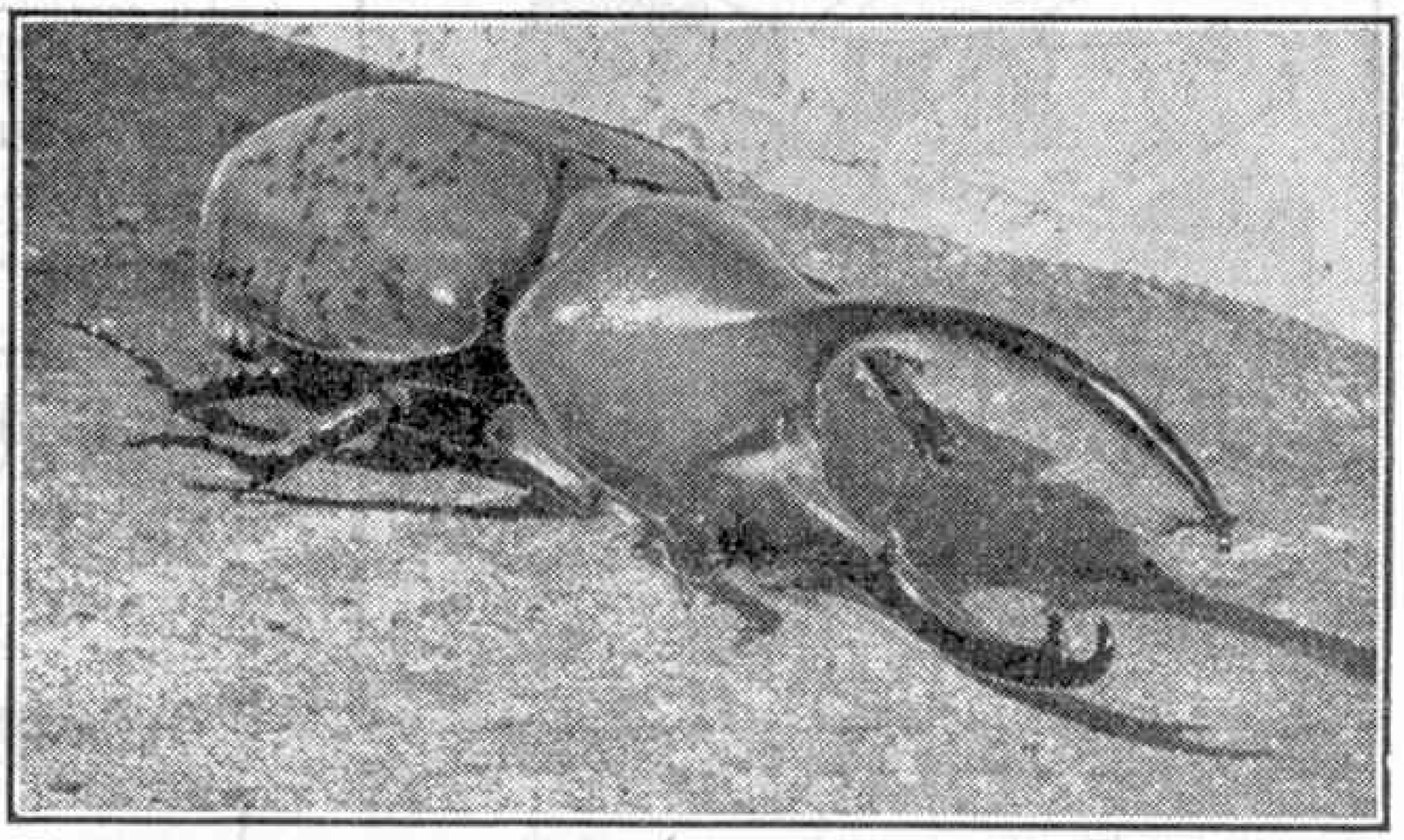
These giant Hercules beetles begin life as bloated white grubs living on decaying wood in the hot steaming jungle. The South American Indians hunt for the larvæ of these great beetles, as a dog searches for truffles, and they figure as a great luxury on their menus. They must be dug out of the rotting timber as they lie circled like great white sausages surrounded by the decaying fibres. The function of these beetle grubs in Nature is to accelerate the decay of fallen timber. With their extremely strong jaws they are able to burrow right inside the trunks, and as they live for several years they riddle the timber with their galleries, so that when the wet season commences the rain penetrates into these tunnels, and lodges there, so that decay quickly sets in.

In my opinion the most interesting of all the foreign beetles are those that are capable of giving out light. We have one in this country, the common glow-worm, that does it on a small scale. But there is a beetle in South America, called the Luminous Elater, that is far more marvellous. On each side of its body, just behind the head there is a curious bulge. These bulges look like an extra pair of eyes, but actually they are really more like two windows in a lighthouse if you look at them closely, as whenever it wants the insect can flash brilliant greenish light through them. The males and females use this weird light to show each other the way they are going when they are on the wing. You can imagine what a firework display it is when great numbers of these Luminous Elaters go streaking across jungle clearings emitting flashes of green fire!

The natives of the districts where these beetles occur put them to very good use. They collect a few during the daytime and keep them in small cages made of fine bamboo sticks. When it gets dark they have a ready-made lamp that needs no oil or battery, costs nothing, and is not blown out by a wind. When the Spaniards conquered the New World in the 17th century they found the natives using these beetles for signalling, as luminous bait for hunting and fishing, and as pretty living ornaments for their womenfolk to wear in the hair.

Now all this is rather interesting and amusing, but have you realised what a miracle of Nature this brilliant light created by insects really is? It is what is known as "cold light," as none of the energy is wasted in heat. You know how quickly an electric light bulb becomes hot when the current is switched on, but with these beetles no heat at all is generated. Of course it is obvious really, because if they did get hot there would soon not be any beetles left, but you don't always think of these things! But I can tell you this—if scientists ever find out a cheap method of producing this "cold light" it will revolutionise the lighting systems of the World.

Another very remarkable group of beetles is the Longhorns. The biggest of them, the Giant Longhorn, has quite a slender body about 2½ in. long, but its antennæ or "feelers" can be stretched out on either side of its body to a foot in length. Now what is more interesting than just the measurements is the reason why it should have such long antennæ—what purpose do they serve? No book on beetles answers this question. I should imagine that these long feelers act partly as the insect's natural camouflage. They live in the tropical Brazilian forests, where giant vines and creepers hang in festoons between the branches of the trees. You can imagine how splendidly hidden this beetle would be sitting between the leaves with its long feelers hanging down among the thin tendrils of the vines. No doubt it uses them to feel with, perhaps even to smell out its food, but one would hardly think it necessary for them to be so long if only for these purposes.



The Hercules Beetle, a South American giant, remarkable for its great horns.

Many of the beetles of the British Isles are well worth studying, and perhaps the three most interesting are the Tiger Beetle, the Bombardier Beetle and the famous Stag Beetle, which I hope to deal with in a further article in the near future.

Meanwhile I suggest you visit your local Museum, or if you come to London for your Christmas holidays call in at the Natural History Museum, South Kensington, where you will be able to see "set specimens" of these wonderful beetles.

Among the Model-Builders

By "Spanner"

POSITIVE FRONT WHEEL STEERING

There are many different ways of building up steering mechanisms for Meccano motor cars and other wheeled vehicles. The more usual types are those based on the Ackermann system, whereby all four wheels of the car turn about the same centre. Usually only one of the front wheels is steered directly from the steering column, the second wheel being connected to the first by tie-rods so that it also is turned. In another arrangement, however, the mechanism is so designed that positive steering is obtained for both front wheels. An advantage of this method is that there is less likelihood of accidents due to faults developing in the mechanism, whereas when only one wheel is positively steered the vehicle may get out of control if anything happens to the connections while it is in motion. It is not difficult to assemble this type of mechanism in Meccano, and it is an interesting variation from the steering systems usually employed in models. A Meccano example is shown in detail in Fig. 1.

The front wheels are mounted on stub axles in the usual manner, the king pins being 1½" Rods free to rotate in the bosses of Cranks bolted to the front axle. The stub axles are fixed to the king pins, to the upper ends of which are fastened ½" Pinions 3 as shown. The shaft 1, which is operated by the steering wheel, is journalled in Trunnions and carries a Worm 2 at each end. The Worms mesh with the ½" Pinions on the king pins. When the steering wheel is rotated, the motion is transmitted through the 1½" Contrate to the ¾" Pinion on the shaft 1. The Worms then operate the front wheels.

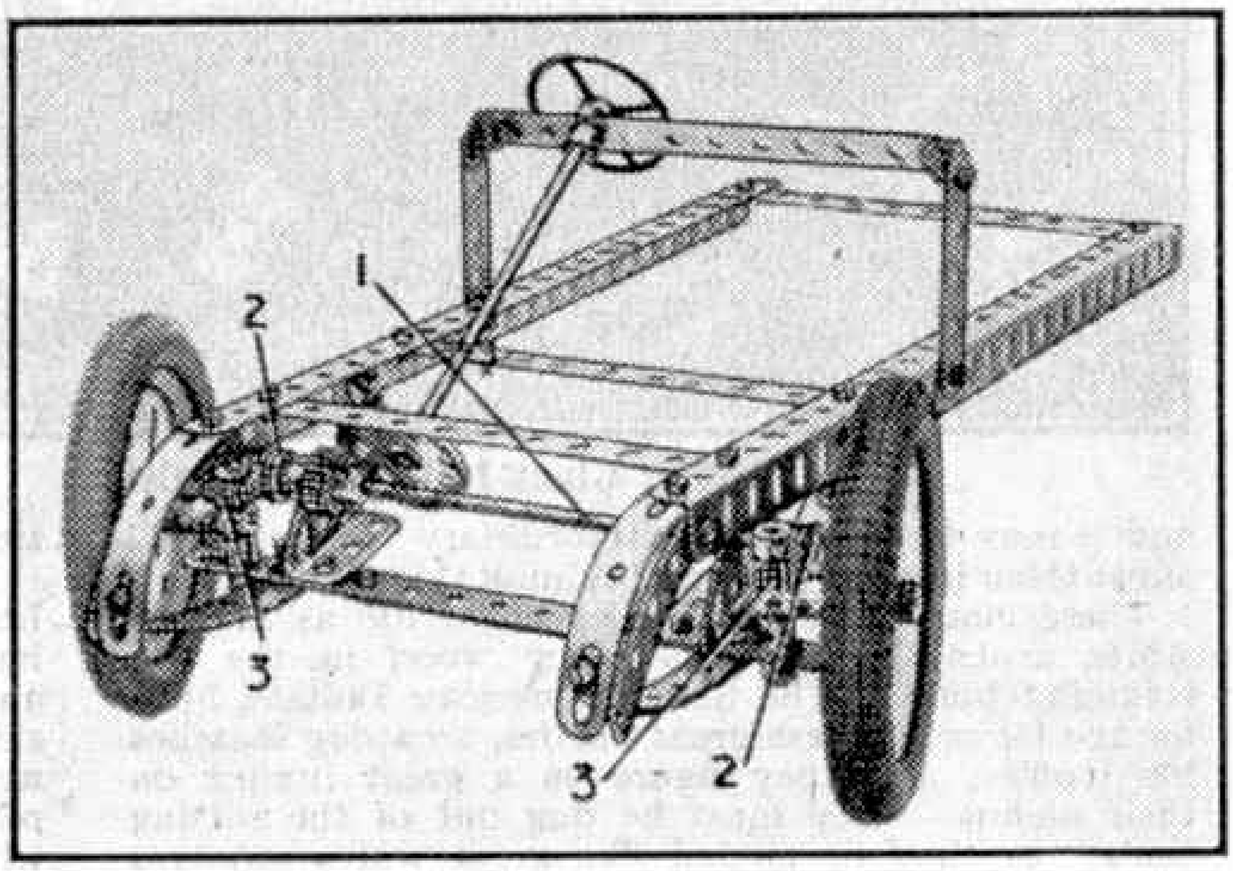


Fig. 1. Positive front wheel steering gear for model motor vehicles.

It will be seen from the illustration that the system is very simple. When once adjusted it needs no further attention.

A VARIABLE SPEED DRIVE
(A. Bedford, Hull)

Fig. 2 shows a variable drive that can be built from a small number of parts and will give a range of speed ratios varying from 1:3 (reduction drive) to 3:1 (step up). It consists of a driving disc 1 formed from a Face Plate mounted on a 1½" Rod driven from the Motor. An idling 1" loose Pulley 2 fitted with a Rubber Ring runs on this disc, and is moved across it to alter the speed ratio by turning a Bush Wheel mounted on one end of a 5" Screwed Rod. This Rod is journalled in two Channel Bearings, and carries two Threaded Cranks fixed together by a ½" Bolt on which the idling pulley is free to rotate.

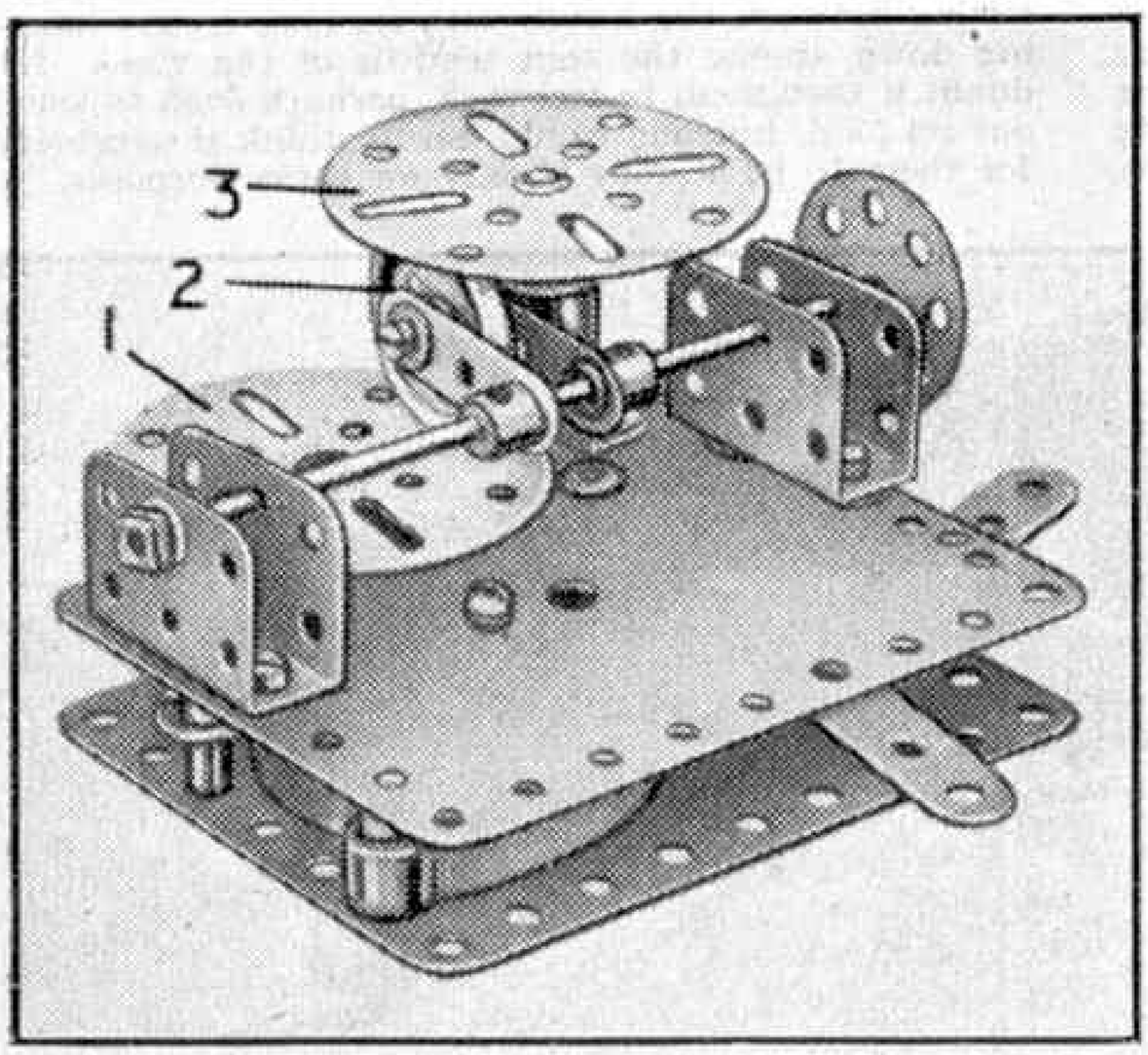


Fig. 2. A variable speed drive mechanism designed by A. Bedford, Hull.

The Pulley 2 drives a similar disc 3 and is kept in contact with both discs by a Compression Spring mounted on the driving Rod and held under compression by a Collar.

PILOT WHEEL FOR SHIP STEERING GEAR

An interesting problem came to my notice when A. Mitchell, Swansea, wrote to tell me of a demonstration model ship steering gear he was

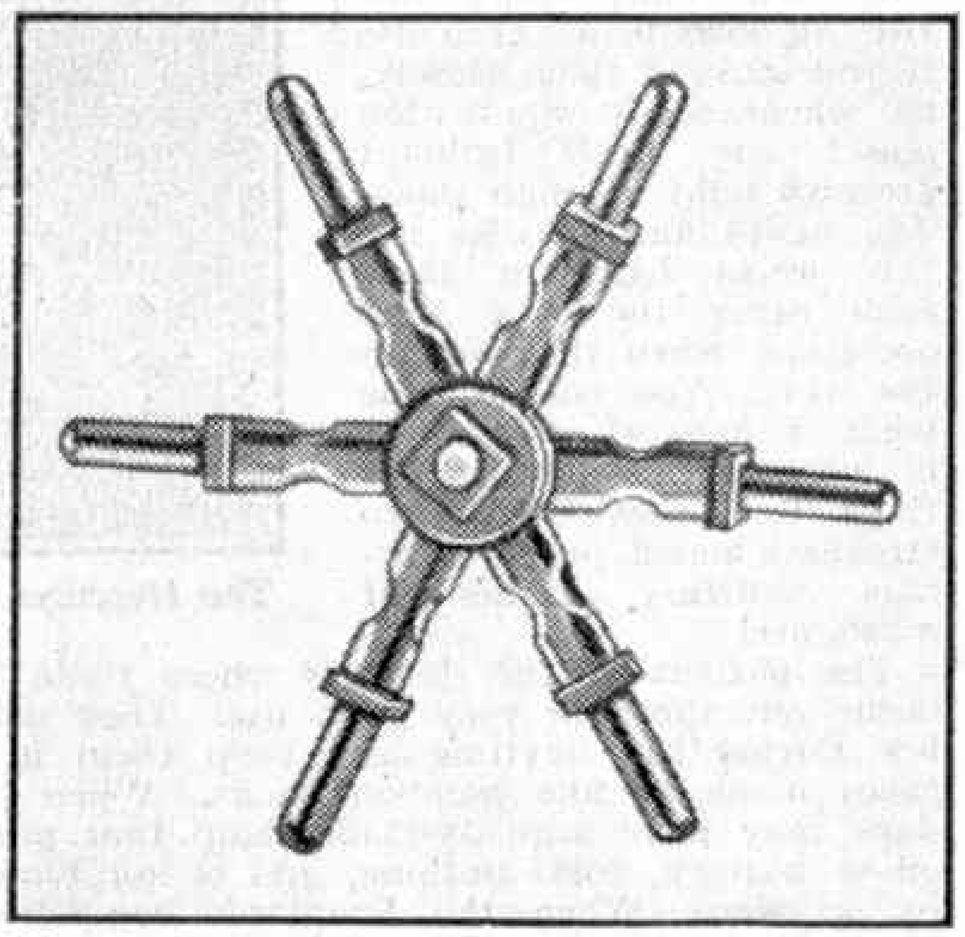


Fig. 3. Suggested method of building a pilot wheel for ship steering gear.

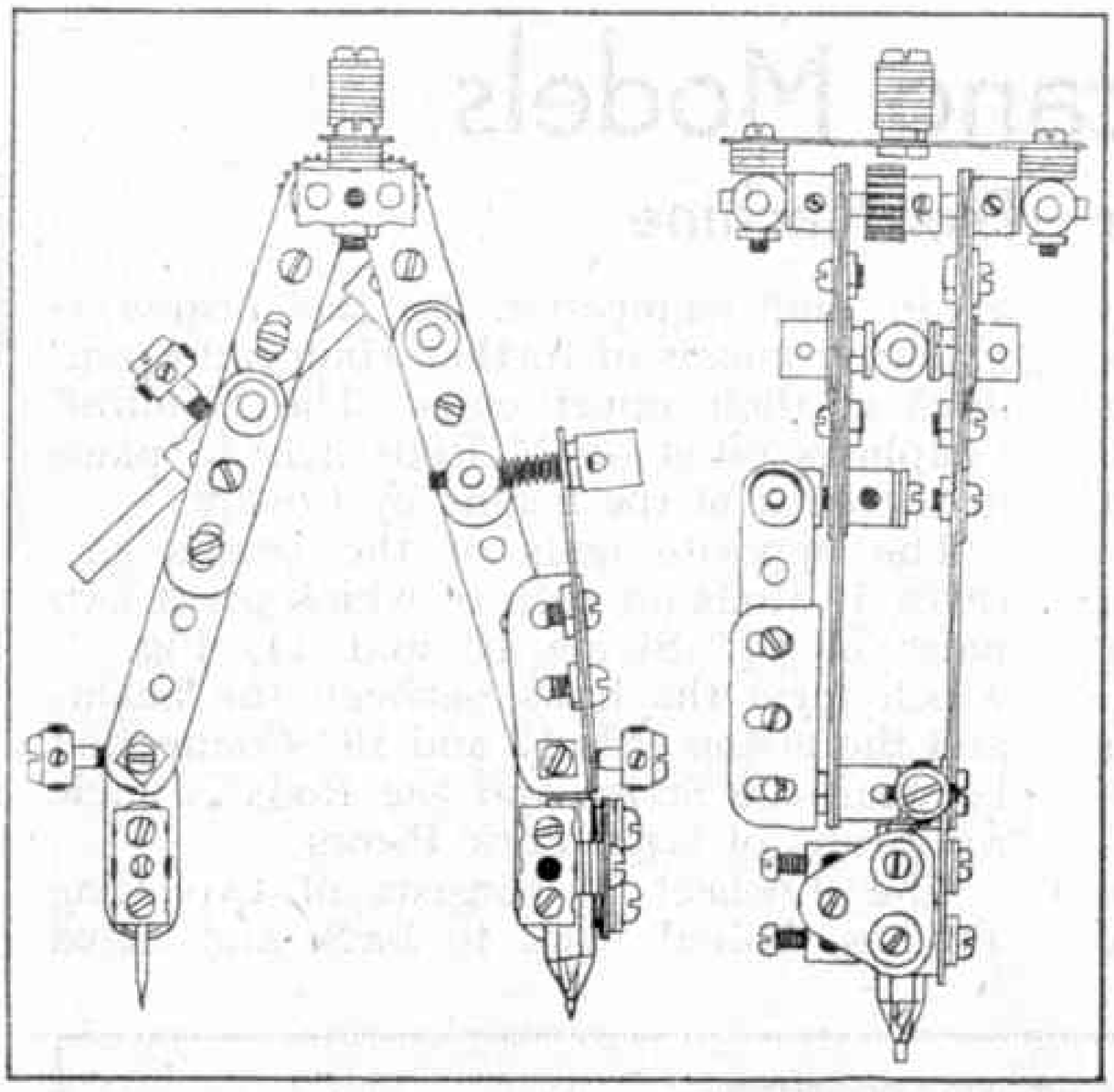


Fig. 4. Meccano compasses designed by A. B. Partridge, Northampton.

building. Having constructed all the main parts successfully, he was puzzled as to how he could represent the pilot wheel on a scale in keeping with that of the model generally. I suggested that something of the kind shown in Fig. 3 might meet his requirements. In the example illustrated the "wheel" is formed from six Rod and Strip Connectors fixed to the shank of a Rod Socket and each holding a Threaded Pin as shown. A larger wheel could be formed by substituting Rods of the required length for the Pins. The Rods could be capped with Handrail Couplings.

MECCANO COMPASS FOR THE WORKSHOP

A. B. Partridge, Northampton, has designed the useful Meccano compass shown in the drawing reproduced in Fig. 4. The general construction of the instrument can be followed from the illustration, but there are one or two special features of the design that require explanation. For example, it will be noticed that the limbs are geared together in the handle. The idea in this is that the method renders the handle self-centring, which is a great convenience in using the instrument.

The pivots of the radius-setting rod are Threaded Pins, which work in the bosses of Cranks. The clamping bolt, which is easily accessible at all settings of the limbs, is a Pivot Bolt, to which a spider from a Swivel Bearing is fixed by four Screws. The pivoting arrangement of the "knee" joint in the limb that carries the pencil consists of a Pivot Bolt that is pushed through one side of the limb, then through the boss of the crank bearing the pencil holder, and screwed into a Threaded Boss until the Crank is held moderately firmly. A ½" Bolt is then passed through the fine adjustment lever and the side of the limb and screwed into the Threaded Boss until it locks against the Pivot Bolt. The ½" Bolt is then secured to the lever by lock nuts. The knee joint for the needle limb is similar, except that one nut locks with the Threaded Boss.

Christmas Model-Building Contest

This Contest is designed to ensure that every model-builder will have a chance to exercise his skill during the Christmas holidays. Fine prizes are offered for the best models received and there is ample time in which to prepare and submit entries.

Models may be of any kind whatever and of any size, but they must be built from Meccano parts. Cranes, motor vehicles, ships, machines of all types and aircraft, are some of the subjects suitable for models.

The actual model must not be sent. A photograph, or if this is not possible a reasonably good sketch, together with brief details of the model's main features, is all that is required.

The competition will be divided into two Sections. A for competitors of all ages living in the British Isles. B for competitors of all ages living Overseas. Section A will close for entries on 31st January 1946, but Section B will remain open until 31st March.

The following prizes will be awarded in each Section of the Contest: First £2/2/–. Second £1/1/–. Third 10/6. There will be also a number of consolation awards.

Competitors must write their name, address and age, on the back of each photograph or drawing sent in, and envelopes must be addressed *"Christmas Model-Building Contest," Meccano Ltd., Binns Road, Liverpool 13.*

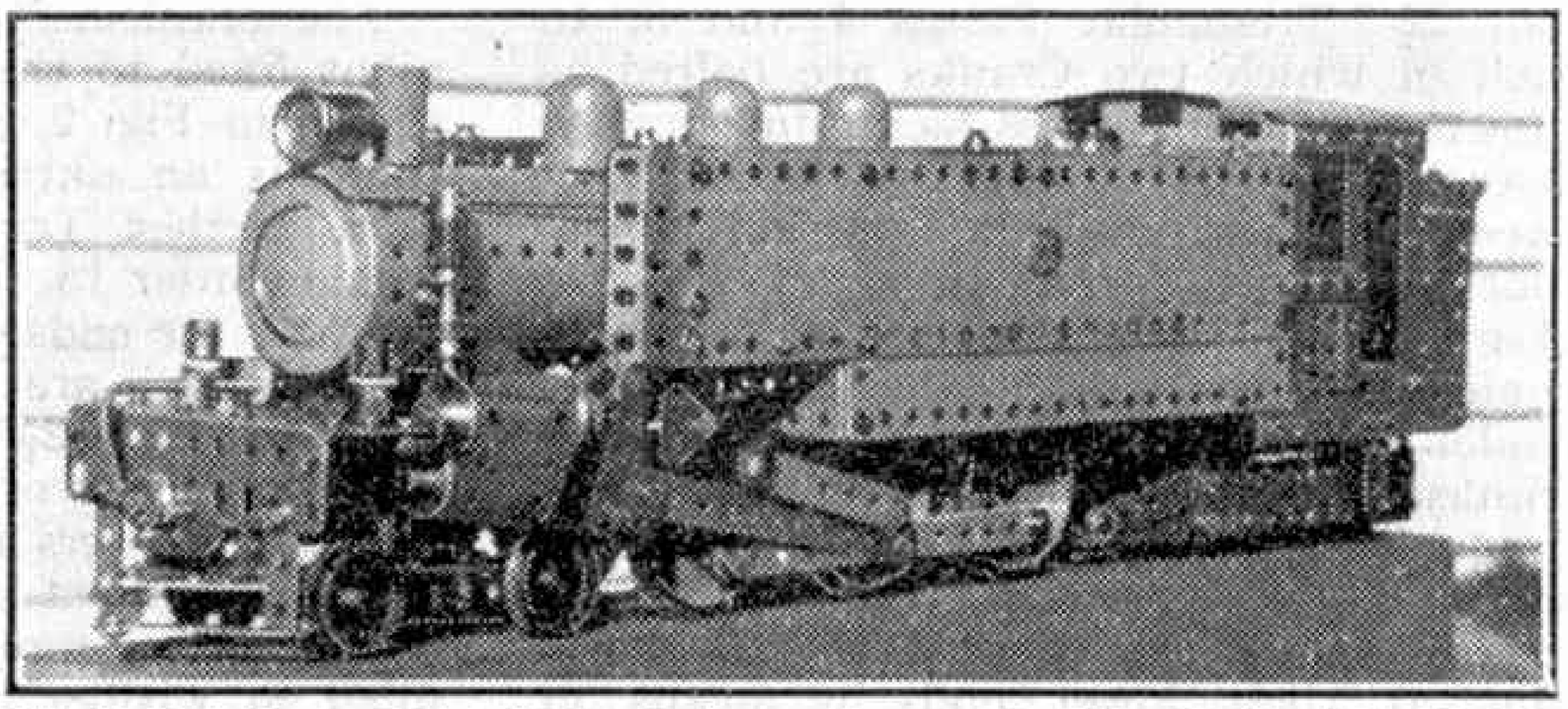


Fig. 5. This fine model 4-6-4 tank locomotive was built by N. Candish, Christchurch, New Zealand. It represents a type in service on the N.Z. Railways.

New Meccano Models

Beam Engine—Fret-Machine

CONSTRUCTION of the model Beam Engine shown in Figs. 1 and 2 is begun by building up two rectangles from 18½″ and 7½″ Angle Girders. For these the ends of two 18½″ Girders are bridged by two 7½″ Girders, the four being securely bolted together. When the two rectangles are built they are connected together by four 5½″ Angle Girders 1 placed one at each corner as shown in Fig. 1. Two further 5½″ Angle Girders 2, Fig. 2, serve as supports for a 5½″ × 3½″ Flat Plate that forms a base for the governor mechanism. The beams are carried on supports consisting of four 18½″ Angle Girders, which are bolted two on each side of the base as shown, and at their upper ends are bolted to 4″ Circular Plates. These Plates each carry a Bush Wheel in which the axle on which the beams pivot is journalled. The construction of the beams will be clear from Fig. 1 The Rod on which the beams pivot is passed through the centre holes of two 4½″ Angle Girders, which form the centre vertical member of the beams. The 9½″ Strips of the beams are bolted to the ends of these Girders.

The cylinders are Meccano Boilers, complete with Ends, which are secured to a 5½″ × 3½″ Flat Plate 3 bolted between the lower 18½″ Angle Girders of the base.

The crankshaft webs are formed by four 2½″ Triangular Plates 4 and 5, to each of which two Cranks are bolted as shown with their bosses facing in opposite directions. The crankshaft carries between the two cranks a Sprocket Wheel that takes the drive from an Electric Motor, which may be bolted in any convenient position inside the base of the model. On the left-hand end of the crankshaft there is another Sprocket, connected by Chain to a Sprocket on the shaft of the governor. The connecting rods 7 and 8 are coupled to the crank pins at their lower ends by means of Handrail Couplings, one of which is shown at 9; and connection to the beams is made by means of further Handrail Couplings at their upper ends. The Handrail Couplings pivot on 1″ Rods held in place in the ends of the beams by Collars.

The opposite ends of the beams also carry 1″ Rods on each of which pivot two pairs of 9½″ Strips 10 and 11, Fig. 1, which form the links between the beams and the piston rods 12 and 13. Connection between the Strips and the Rods is made by means of large Fork Pieces.

The flywheel 14 consists of two Ring Frames, bolted back to back and fitted with spokes consisting of 4½″ Strips. The hub of the wheel is a Face Plate.

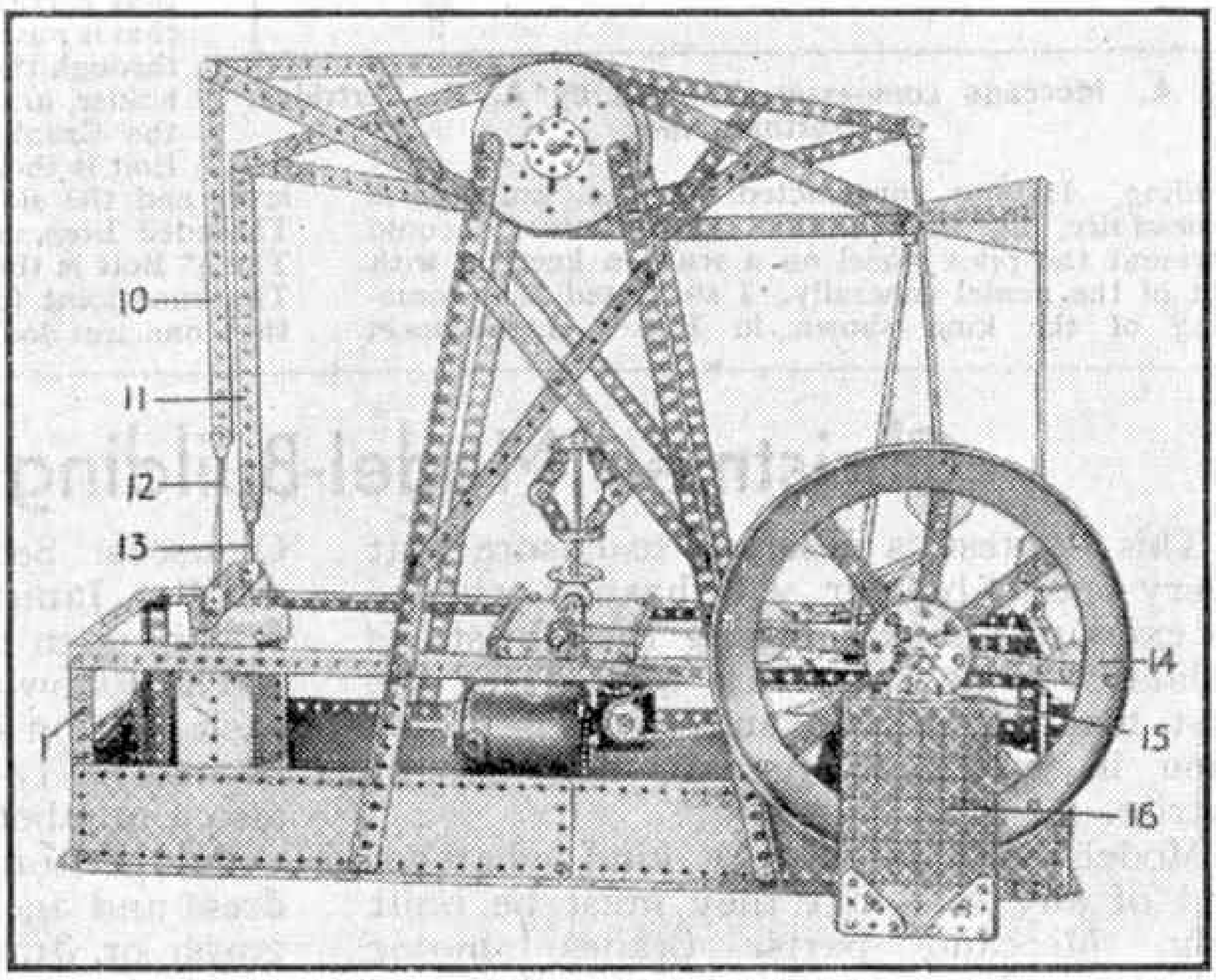


Fig. 1. A fine working model Twin Beam Engine.

The crankshaft is journalled in Trunnions fixed to the frame in the positions shown in Fig. 2, and at the flywheel end there is an outrigger bearing consisting of a further Trunnion bolted to a 3½″ Angle Girder 15. This Girder is supported between the ends of two 5½″ Angle Girders that in turn are attached at their lower ends to the 12½″ Angle Girders of the base by means of two 3½″ Angle Girders. The 5½″ Girders are also joined at their lower ends by a second 3½″ Angle Girder, and the rectangular frame so formed is filled in with a 5½″ × 3½″ Flat Plate 16.

The construction of the governor is

shown clearly in the illustrations. Its shaft is journalled in the Flat Plate and also in a Double Bent Strip 17 bolted to the Plate; and a $1\frac{1}{2}''$ diam. Contrate fixed to it is meshed with a 1" Gear carried on a Rod journalled in a $2\frac{1}{2}'' \times 1''$ Double Angle Strip bolted to the Plate.

Parts required to build model Beam Engine: 24 of No. 1a; 8 of No. 2a; 8 of No. 3; 4 of No. 6a; 8 of No. 7a; 16 of No. 9; 4 of No. 9a; 4 of No. 9b; 6 of No. 12; 3 of No. 13a; 1 of No. 14; 3 of No. 15; 1 of No. 15b; 1 of No. 16; 2 of No. 18a; 6 of No. 18b; 4 of No. 23; 4 of No. 24; 1 of No. 28; 1 of No. 31; 174 of No. 37; 10 of No. 37a; 3 of No. 45; 1 of No. 46; 3 of No. 52a; 21 of No. 59; 8 of No. 62; 2 of No. 95; 1 of No. 96; 1 of No. 109; 2 of No. 111; 2 of No. 116; 4 of No. 126; 8 of No. 126a; 4 of No. 133; 4 of No. 136a; 2 of No. 146a; 2 of No. 162; 2 of No. 167b; 2 of No. 190; 2 of No. 192; 4 of No. 197, 1 Electric Motor.

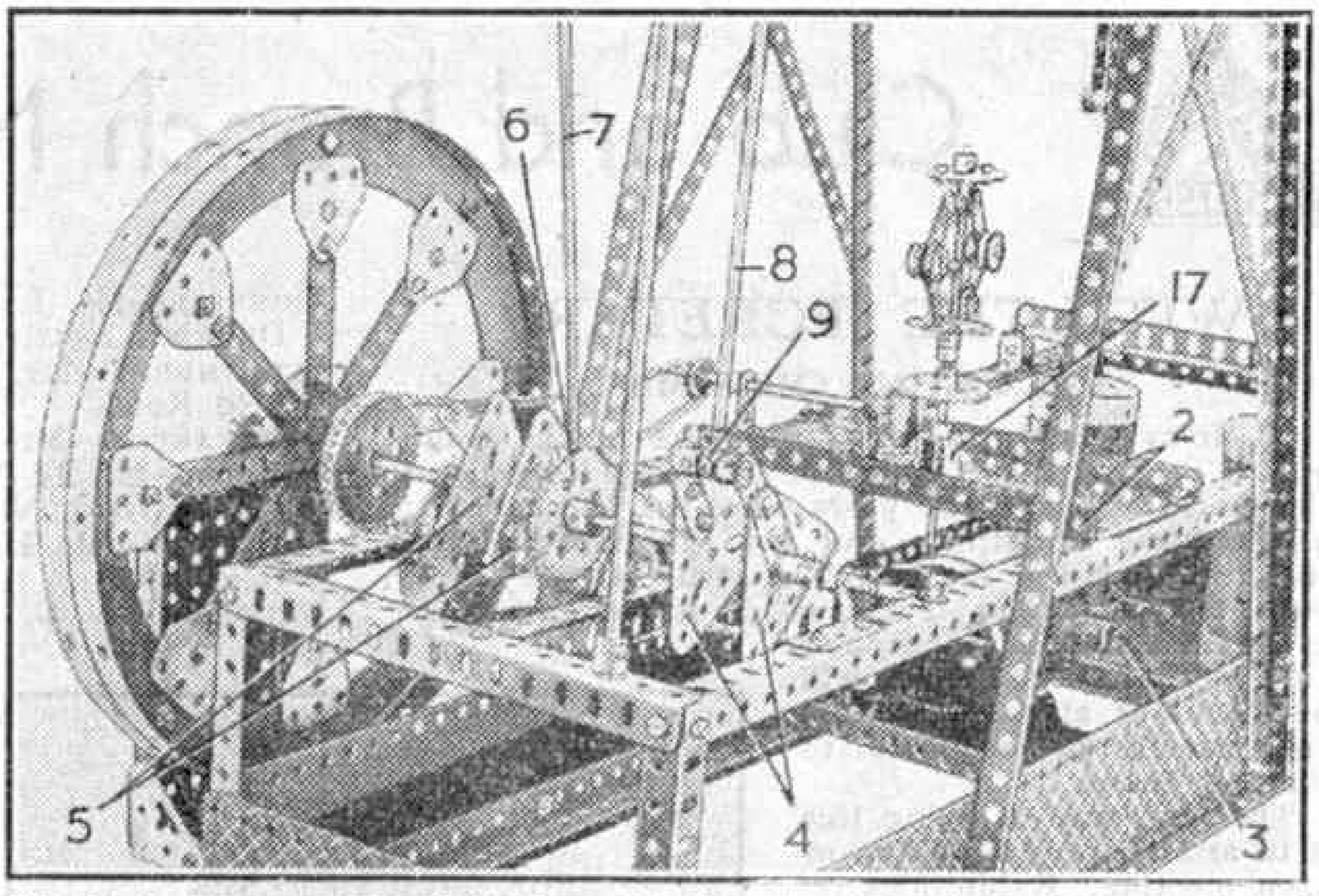


Fig. 2. A close-up view of the Beam Engine showing details of the crankshaft and governor.

The simple and attractive model of a fret-machine shown in Fig. 3 can be worked either by hand or by a *Magic* Motor.

The table of the machine is built from four $5\frac{1}{2}''$ Strips and a $4\frac{1}{2}''$ Flanged Sector Plate and braced by two $5\frac{1}{2}''$ Strips, as shown in the illustration. The reciprocating arm consists of two $5\frac{1}{2}''$ Strips, one above the table and the other underneath it, joined together by two $2\frac{1}{2}''$ Strips 1 bolted to the $5\frac{1}{2}''$ Strips in the manner illustrated.

The arm is pivoted on a lock-nutted bolt through the holes of two Reversed Angle Brackets, which are spaced from the $1\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip 2 by two Washers, and also through the centre holes of the $2\frac{1}{2}''$ Strips 1.

The bracing of the table legs carries a $3\frac{1}{2}''$ Crank Handle. On this is a cam built by bolting two Flat Brackets spaced by a Washer on each side of a Bush Wheel, together with a Road Wheel and a 1" fixed Pulley. The positions of these will be clear from the illustration. A piece of wire is stretched from the end hole of the upper $5\frac{1}{2}''$ Strip to that of the $5\frac{1}{2}''$ Strip under the table, and passes through the appropriate hole in a $4\frac{1}{2}''$ Flanged Sector Plate. This represents the saw blade.

A quick return stroke is effected by doubling a small Driving Band 3 over the arm and looping it on to a Cranked Bent Strip 4, through which the $1\frac{1}{2}''$ Rod 5 is pushed. If desired, the *Magic* Motor can be bolted to the front leg of the fret-machine and the Driving Band fitted around the 1" Pulley. If a Motor is used, it is advisable to strengthen the front legs by connecting them together with a Double Angle Strip bolted near their lower ends.

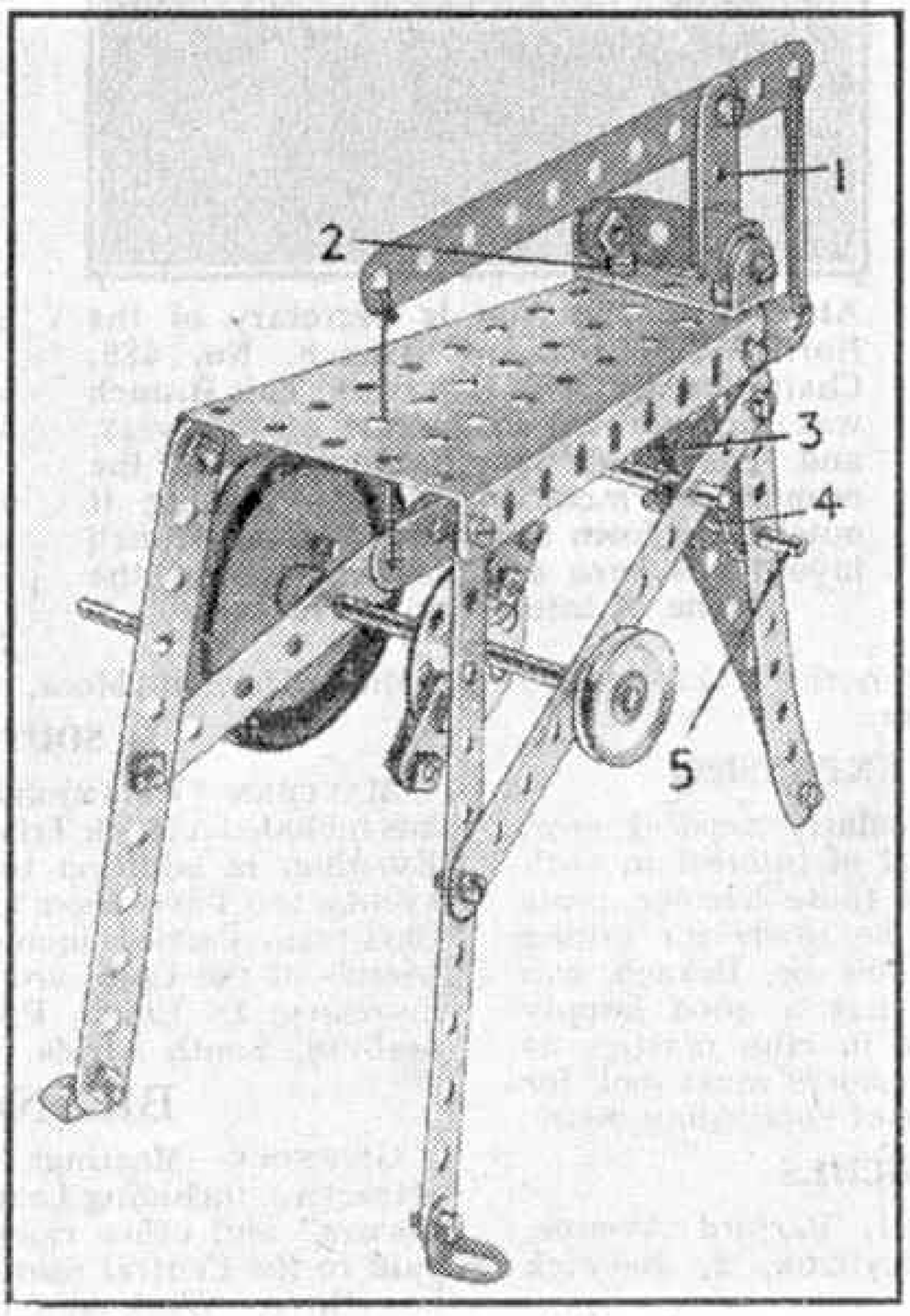


Fig. 3. A simple fret-machine that operates realistically.

Parts required to build Fret-machine: 8 of No. 2; 2 of No. 5; 4 of No. 10; 2 of No. 12; 1 of No. 17; 1 of No. 17a; 1 of No. 19s; 1 of No. 22; 1 of No. 24; 2 of No. 35; 21 of No. 37; 1 of No. 37a; 8 of No. 38; 1 of No. 44; 1 of No. 48; 1 of No. 54a; 1 of No. 111c; 2 of No. 125; 2 of No. 180; 1 of No. 187.

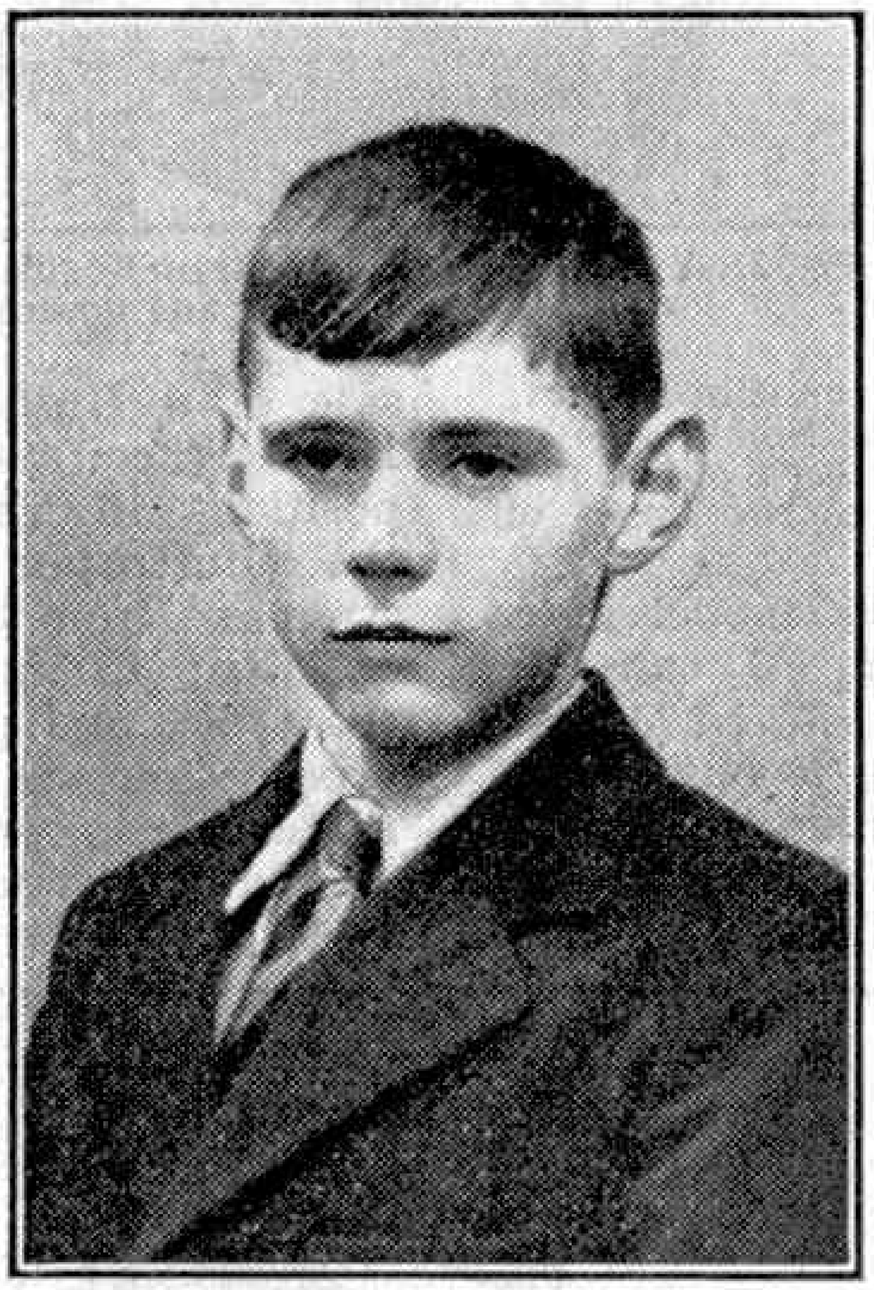
Club and Branch News

WITH THE SECRETARY

A PEACETIME CHRISTMAS

A Merry Christmas to all members of the Guild and H.R.C., and to Clubs and Branches throughout the world. It is seven years since we last enjoyed a peacetime Christmas, and the general festivities this year should be more light hearted than they have been for a long time. There will be happy gatherings in all Clubs and Branches, and I hope that some means will be found of allowing parents and friends of members to share in them.

The best way of doing this is to arrange an Exhibition or open meeting. Exhibitions on the pre-war scale may not yet be possible, although sufficient can be done to show that members not only enjoy themselves, but gain valuable knowledge and experience at Club and Branch meetings. Where efforts of this kind are arranged I should like special attention to be given to newcomers. For the first time for several years Meccano Outfits will be available this Christmas, and although the range of these will be limited to the smaller sets there will be many boys who with them will be introduced to the Meccano hobby. All of these boys are likely recruits for Club membership, and a special invitation should be given to them to see for themselves what club membership means. This invitation is given best by the recruiting activities of those who are already members, and they should be encouraged to ask their friends to the Exhibition or open meeting, or whatever is arranged, with a view to enrolling them as members. The news can be passed around in other ways too, for example by means of some form of advertisement, or by a notice exhibited by arrangement by a friendly dealer.



Alan J. S. Paterson is Secretary of the North West Glasgow Branch, No. 485, Chairman, Mr. J. S. Paterson. This Branch was incorporated in August of this year, and has made excellent progress, the number of members already making it possible to form Sections. A good Branch layout has been designed and is now the scene of interesting operations.

PREPARE NOW FOR EXPANSION

Steps of this kind are particularly needful now. There is sure to be a fine revival of interest in both Meccano and Hornby Trains as these become more plentiful, and provision should be made for taking full advantage of this. No Club or Branch can continue successfully unless it has a good supply of recruits, who gain experience in club matters as they grow. It is to them that Leaders must look for the secretaries and other officials of succeeding years.

PROPOSED BRANCHES

BEDFORD—Mr. P. Robertson, 91, Barford Avenue.
HEATON MERSEY—Mr. J. Coldeybank, 2, Berwick Avenue, Heaton Mersey.
GLASGOW—Mr. P. Bell, 12, Barfinan Drive, S.W.2.
ROCHDALE—Mr. L. Entwistle, 86, Cheetham Street.
DUNKIRK—Mr. J. W. Banister, 16, Montpelier Road, Dunkirk, Nottingham.
SCUNTHORPE—Mr. G. Davies, "Grabryn," 82, Bushfield Road.
CAERNARVON—Mr. W. Rear, Fach Goch, Waenfawr.
LONDON—Mr. D. Wiles, 129, Hamilton Terrace, St. Johns Wood, N.W.8.
SALISBURY—Mr. H. T. G. Cresswell, Paccombe House, Downton.
BRISTOL—Mr. G. J. Faulkner, 54, Ashton Road, Bristol 3.
HOVE—Masters Skelton and Bernardi, 64, St. Aubyns, Hove 3.

RECENTLY INCORPORATED BRANCHES

483. CARDIFF—Rev. N. Griffiths, B.A., 76, Mackintosh Place, Cardiff.
484. CAER URFA—Mr. A. W. Martin, Toc H Services Club, Westoe, South Shields.
485. NORTH WEST GLASGOW—Mr. J. S. Paterson, 41, Thomson Drive, Bearsden, Glasgow.
486. LOUTH—Mr. L. W. Carter, c/o Mrs. Borrill, "Abri," Louth Park, Louth, Lincs.

CLUB NOTES

STAPLEFORD (NOTTS.) — In addition to Model-building, meetings have been devoted to indoor and outdoor Games. A Cycle Ride has been enjoyed. A Treasure Hunt, Lectures and a "Quiz" have completed an excellent programme. Club roll: 12. *Secretary:* P. R. Dennis, 36, Hickings Lane, Stapleford, Notts.

DURHAM—A successful Exhibition increased Club funds by 12/-. Models shown included ships, an omnibus, and an aerial ropeway, and a Film Show was a great attraction. The Exhibition concluded with a firework display. Club roll: 7. *Secretary:* T. C. Hindson, Westholme, Durham Moor.

SOUTH AFRICA

MALVERN (JOHANNESBURG) M.C.—The programme has included a Mock Trial, a Film Evening, and a Boy's Evening, in addition to Construction Nights. Social events too have been arranged and greatly enjoyed. Christmas Parties, including one for ex-members and friends of the Club, are being planned. Club roll: 23. *Secretary:* D. Eblen, P.O. Box, 8, Cleveland, Johannesburg, South Africa.

BRANCH NEWS

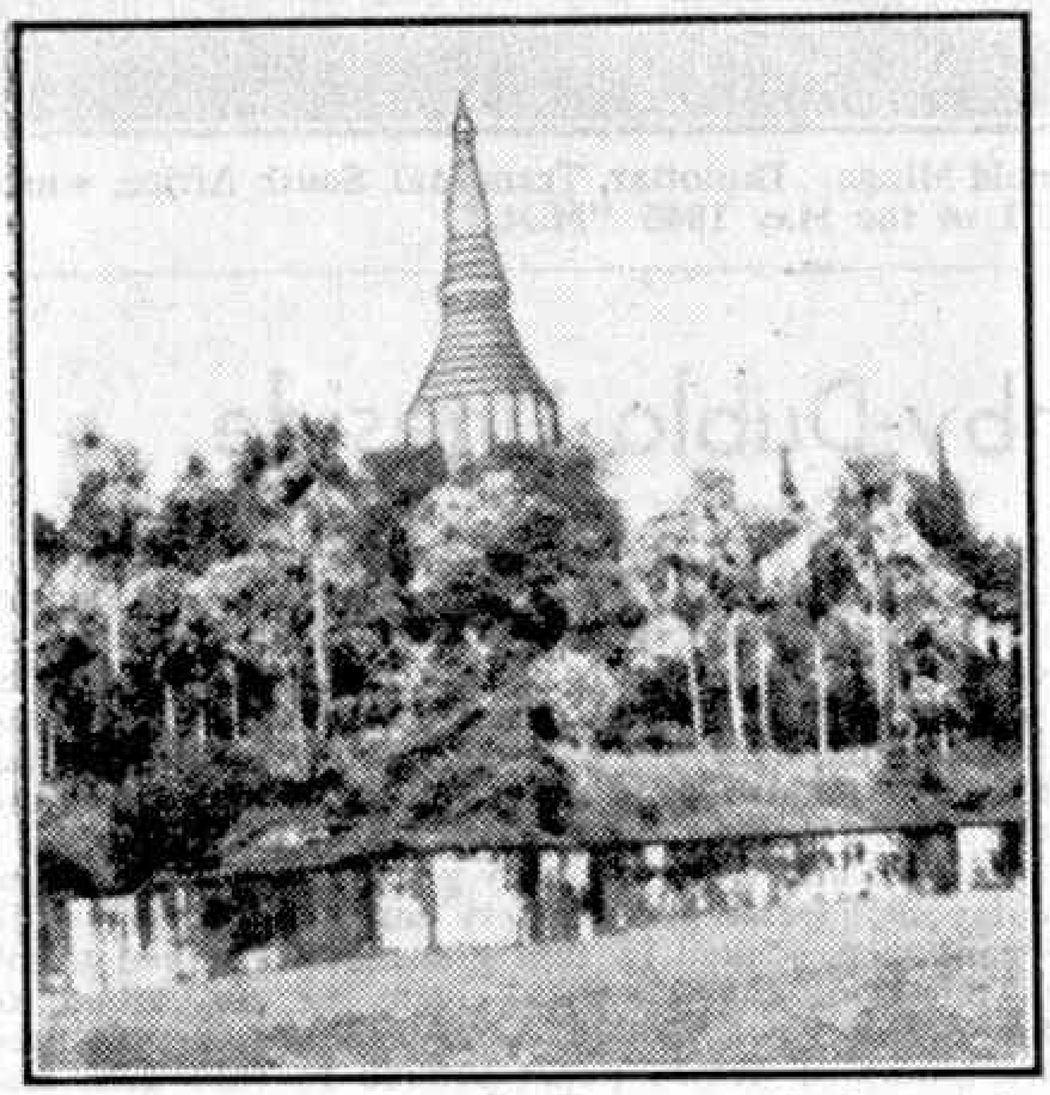
GIFFNOCK—Meetings continue to be varied and attractive, including Lectures on "*Signalling*," "*Engine Classes*" and other railway topics. A visit has been paid to the Central Station, Glasgow, to see the signal box there. Work and operations on the track continue. *Secretary:* R. G. Provan, 15, Bulloch Avenue, Giffnock, Renfrewshire.

From Our Readers

This page is reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of which the writer has special knowledge or experience. These should be written neatly on one side of the paper only, and should be accompanied if possible by original photographs for use as illustrations. Articles published will be paid for. Statements in articles submitted are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

BURMA'S MOST FAMOUS PAGODA

The Shwe Dagon Pagoda, which stands on a commanding hill in Rangoon, was glittering in the myriad rays of the noonday sun when I paid a visit to it. According to legend it was built 2,400 years



The Shwe Dagon Pagoda, Rangoon. Photograph by R. D. Barrett-Leonard, S.E.A.C.

ago by King Ukkalapa, during the lifetime of Gautama Buddha, the founder of Buddhism. Its special sanctity is derived from the presence of eight sacred hairs of Gautama that lie buried beneath it, along with other relics.

It is said in the legend that two brothers, Taphussa and Bhallika, who went to India with a ship-load of rice, offered honey cakes in exchange for eight of Gautama's hairs, which were to be buried on Singuttara Hill. On their return to Burma, however, they were relieved of two hairs by the King of Ajettha, and two more were stolen by the King of Dragons, who transformed himself into a human being, and by night sailed away on a golden ship.

Sakka, lord of heavens, came down to Earth to assist in selecting the site. Before the relics were hidden in a cave in the hill King Ukkalapa opened the ruby casket containing the hairs, and instead of four, eight flew up into seven palm trees, which emitted such brilliant rays of variegated hue that the dumb could speak, the deaf could hear, and the lame could walk, and a rain of jewels fell to a great depth. Sakka placed a golden stone slab on top of the cave, and on this the golden pagoda now stands, enclosed within silver, tin, copper, lead, marble, and iron-brick pagodas towering to a great height.

Through the ages many monarchs helped with the reconstruction of the pagoda but it was first given something of its present appearance by a queen named Shinsawbu, for it was she who first gilded the pagoda, and dedicated slaves and land. Shinsawbu's son-in-law and successor, Dammazedi, erected an inscription telling the legend of the foundation of the Pagoda. Succeeding Kings honoured the Shwe Dagon with annual gifts and on occasion repaired the fabric, and one monarch who made a new Hti or Crown for it gilded this with his own weight in gold. The present Hti or Crown was elevated in 1871.

The biggest festival held in the Pagoda is the Tabaung in March, when there is a lavish display of hospitality. The building has not withstood the ravages of time without incident. It suffered damage in seven earthquakes between 1564 and 1919, and was damaged by fire in 1930.

R. D. Barrett-Leonard (S.E.A.C.).

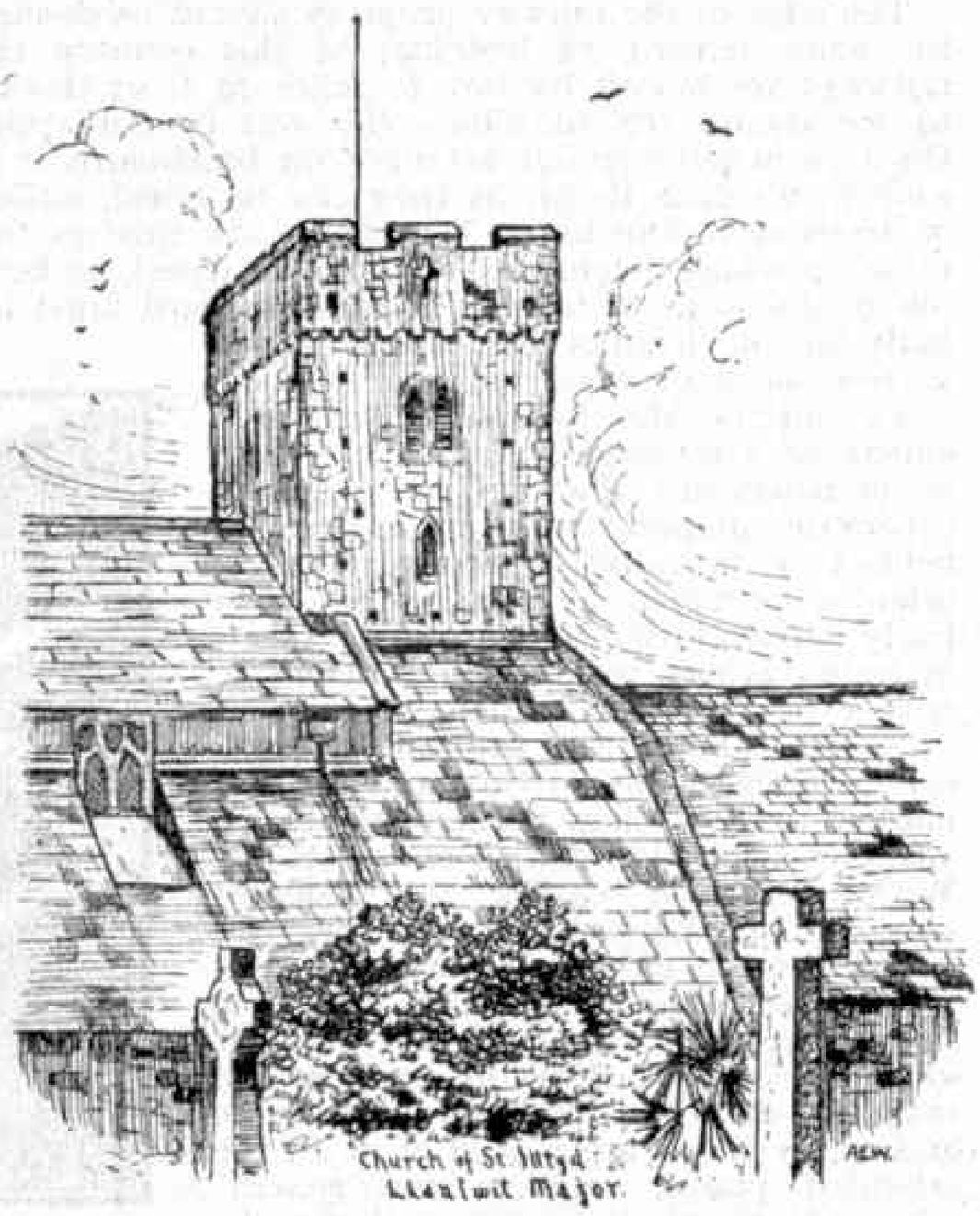
A HISTORIC WELSH CHURCH

The historic church of St. Illtyd in Llantwit Major, Glamorgan, can be traced back to 486 A.D. It was founded in the last quarter of the 5th century by St. Illtyd, who came here from Brittany at that time. The saint also founded a monastery and a school near the church, and taught several famous men, including St. David.

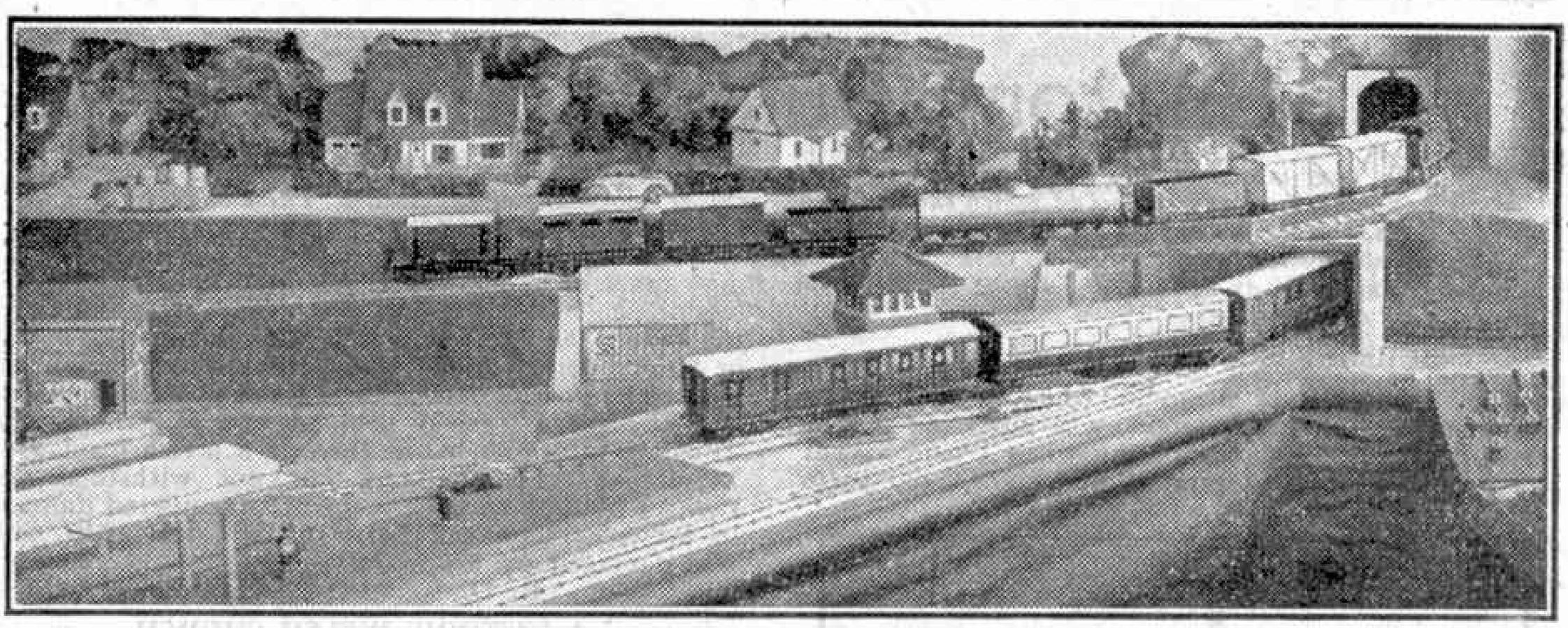
On the walls of the church are several early paintings. Of these the earliest shows St. Christopher crossing a stream. The chancel arch is decorated with a checkered design which is said to be characteristic of many 15th century South Wales churches. The most interesting woodwork in the church is in the roof of the Western section. This is of Irish bog oak, which is said not to harbour vermin.

In the western portion are several Celtic crosses, among which the crosses of St. Illtyd and St. Samson are the most interesting. At the west of the church is the ruin of the Galilee chapel, consisting of an upper storey and a basement. In the upper storey there was an altar, but now only a piscina and a niche remain.

B. S. Weightman (Barry).



The church of St. Illtyd, Llantwit Major. Drawing by A. E. Weightman, Barry.



Attractive scenic effects on the Hornby-Dublo layout of Donald Mingay, Dunottar, Transvaal, South Africa, which was described on page 171 of the May 1945 "M.M."

Improving Your Hornby-Dublo Lineside

WHEN a layout consists simply of the railway and the necessary stock for working it the fun of operations is sometimes found to fall a little flat. This usually is because the necessary "atmosphere" is missing; the railway is "all railway" and nothing else. This can be remedied by some attention to the lineside and the general surroundings of the system.

Certain items of a railway character for improving the station and yard, such as water tanks, huts and so on, have been dealt with from time to time in these pages. Suggestions for making these from Plasticine were included in the April and September issues in 1943. This material can be made use of for many other purposes in connection with accessories for Dublo railways and those of larger scale.

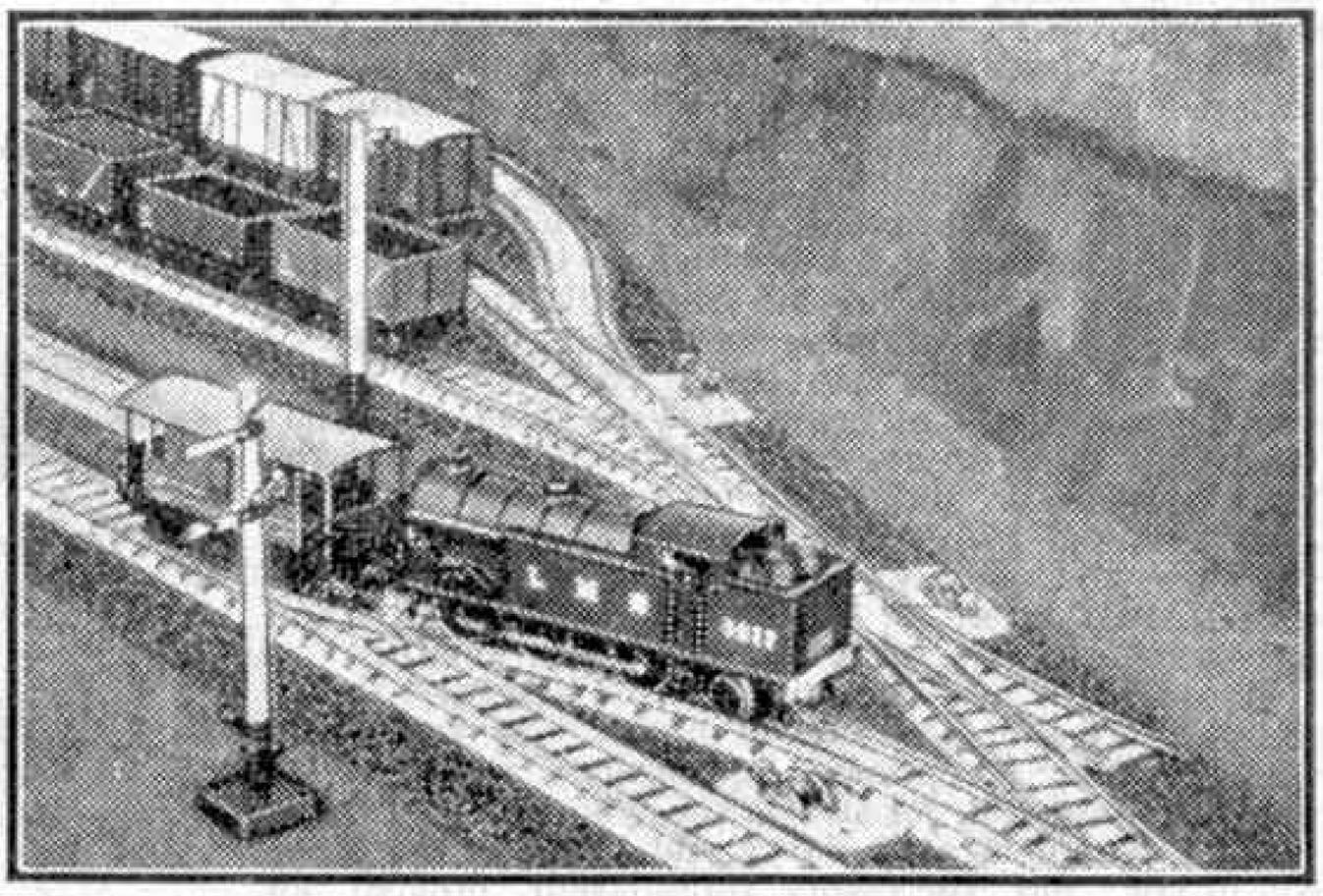
The edge of the railway property should be defined by walls, fencing or hedging; in this country the railways are bound by law to fence in their tracks, so we should try to follow this out in miniature. On a permanent layout arranged on baseboards it is easy to fix such items, as they can be glued, nailed or screwed to the base. We cannot do this on the table on which a temporary layout is placed, so here our model walls or fencing of wood or card must be built up in lengths and mounted on narrow bases of wood or card.

To supply the necessary "ground" effects on a temporary line, where there is no baseboard that we can paint or otherwise prepare to represent earth, field, rock or railway yard surfaces, is often a problem. It can be got over fairly satisfactorily by the use of sheets of rough brown paper, large enough to cover the table on which the line is arranged. The path of the railway track can be marked out on this, and the rest marked to show where stations, buildings, yards, roads, fields and so on are to be. With paints or chalks the different sections can be coloured, taking care not to get too uniform a surface as this would look unnatural. The use of a simply prepared "ground sheet" of this kind will help considerably towards the realistic effect. Individual accessories and scenic items are placed on it in the intended places, and so the general surroundings of the railway begin to take shape.

Background scenery is not usually possible on the ordinary temporary layout, but we can do something in the way of surrounding buildings. The construction of houses, shops, and other structures from thin card is not difficult, though it does require patience. Often it is possible to make use of boxes or cartons to be found in the house as the basis of a miniature building. Constructional details can be added as required and the whole then painted.

Hedges and trees add very greatly to the realism of a layout. Quite good effects can be produced with clean twigs soaked in thin gum to strengthen them, cotton wool covered with green ink and glued to fix it in place. Rough rocks are best represented by crumpled brown paper soaked in thin gum and painted when dry.

Permanent layouts naturally offer greater scope for actual scenic items, and painted background scenery can be used to provide a satisfactory "depth" of countryside. A remarkably good example appears in the upper illustration on this page. Here the scenic background practically divides the layout into two parts, trains disappearing into the "backstage" area by means of the tunnel mouths and re-appearing similarly elsewhere on the layout.



Hornby-Dublo main line and sidings in a cutting. In the background brown paper suitably supported represents the face of a rock cutting.

Fun With Your Hornby Trains

A Useful Layout Plan

THIS month we take for our subject the layout shown in the diagram reproduced on this page. This is not a complicated affair, yet it contains practically all the essentials for interesting and realistic working; in addition it is quite well adapted, in its main plan at least, to make possible a "railway game" that may form part of the usual Christmas festivities.

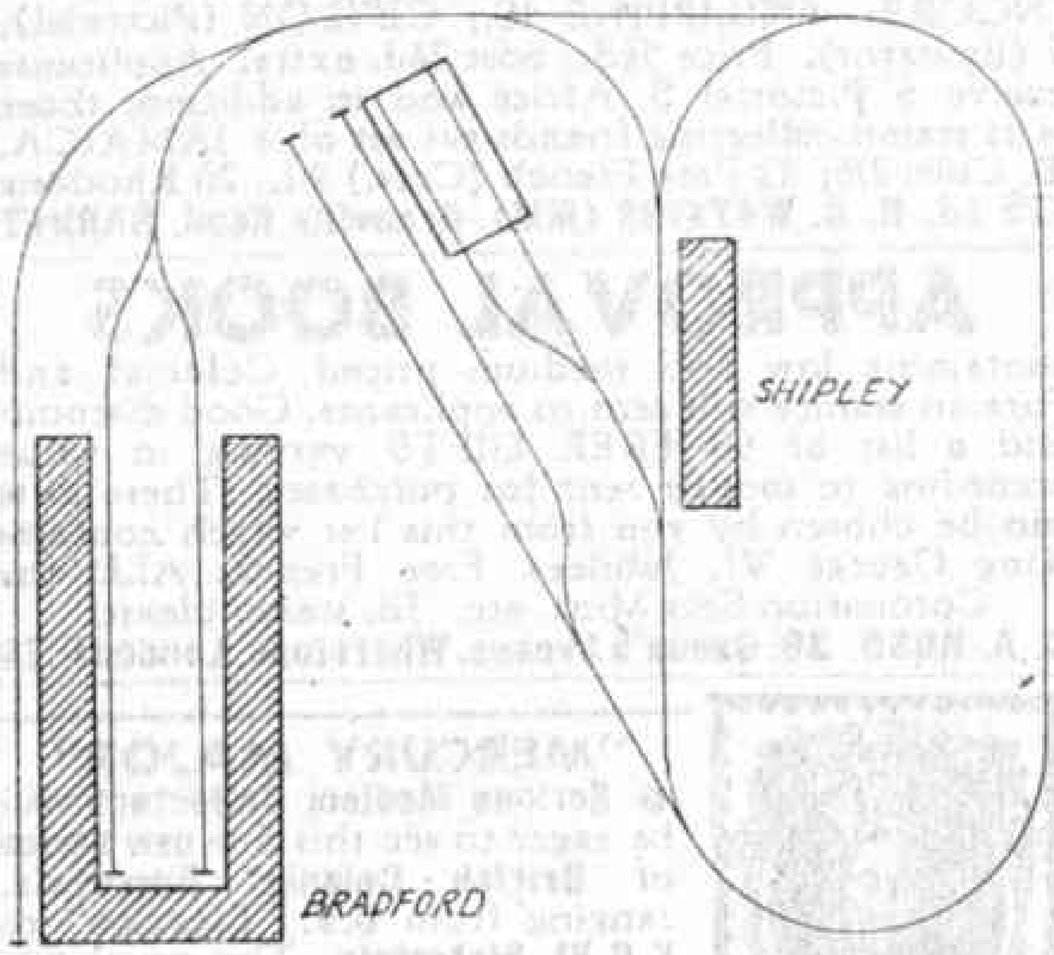


Diagram of the layout referred to on this page.

The layout is actually the projected design for a system that it is hoped to instal when Hornby Railway material is plentiful again. The designer is our reader D. A. Naylor, Shipley, Yorks., who is an L.M.S. railwayman. Naturally he has chosen to represent his own district, so that the two stations to be situated on the line are respectively "*Bradford*," a terminus corresponding to the Forster Square station of real practice, and "*Shipley*," the latter being placed on the continuous part of the track. Those whose preference is for some other part of the L.M.S., or any other railway for that matter, can adopt the plan just as well.

The terminus is situated fairly well away from the continuous oval and the terminal branch is linked to the latter by means of a triangular junction layout. This triangle forms the key to the whole situation from the running point of view, and it is practically the only part of the line that cannot easily be lengthened or shortened without upsetting the relationship between the various pieces of track of which it is formed. The main oval can be made longer or wider; the terminal branch can be altered, and sidings can be modified, extended or multiplied. Let us see how this triangular junction is made up.

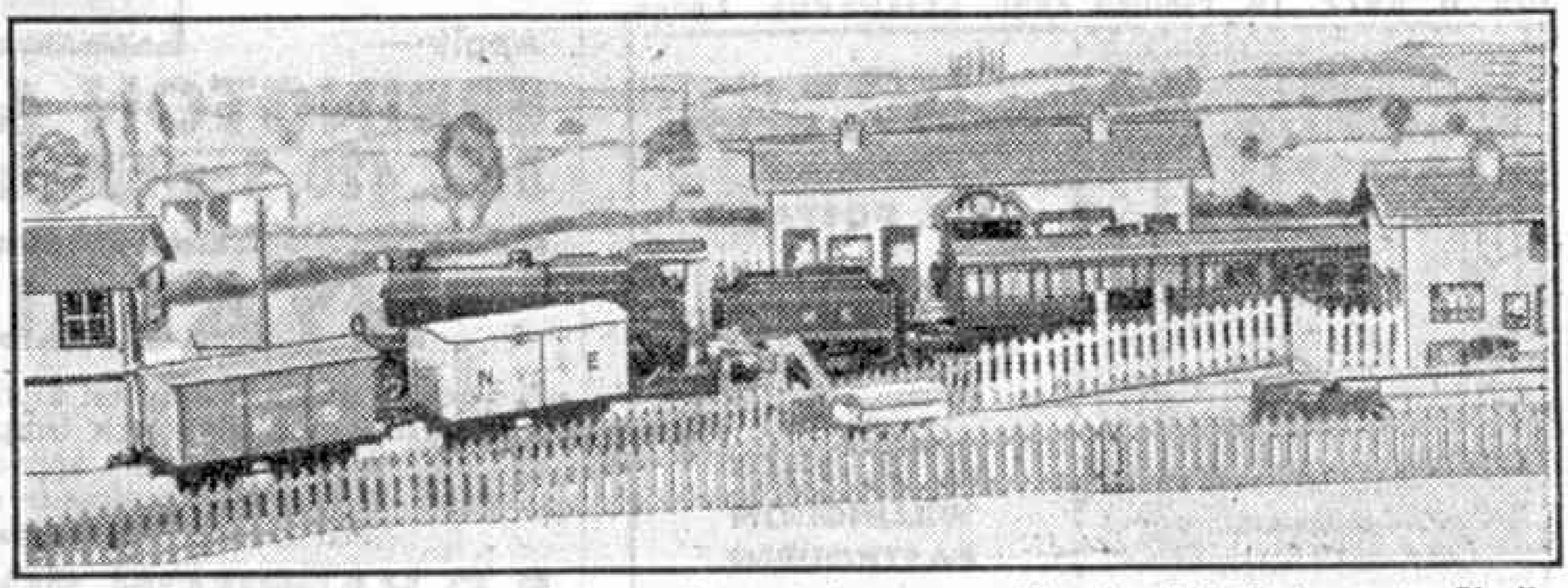
Starting at the "*Shipley*" end of the junction we find a set of double symmetrical points forming a "Y." To each of the curved arms of these points is added a standard 2 ft. radius curve. One of these, at the "*Bradford*" end of the junction, joins up the curved arm of a set of ordinary right-hand points. The other in a similar manner meets the curved arm of a set of left-hand points. This brings the straight sections of these two sets of points into line with one another. To close the gap between the two and so complete our junction we need two straight rails, one straight half and one quarter.

The advantages of the triangular junction can be realised best if we trace the working of a train from the terminal platform. On reaching the junction a choice of routes is afforded. The train can either proceed straight on across the top line in the diagram, or it can curve to the right and pass through the intermediate station almost at once. Probably several circuits of the main line will be made, with stops at the passing station as required. Finally, whether the run is made clockwise or anti-clockwise on the main track, the junction affords a ready means of diverting the train back to the terminus.

On arrival there the engine is not required to run round the train, so no crossover points are laid in for this purpose. Instead the train is backed out, taking the straight routes at the junction and stopping when the engine is clear of the second set of points. The latter are set over and the train moves forward round the curve towards the double symmetrical points, stopping again when the last vehicle has cleared them. Another backing movement over the left-hand arm of these points will bring the train into the terminus again with the engine in the correct position for another journey. Thus the whole train with engine complete has been turned round.

Close to "*Shipley*" station are situated various sidings and an engine shed. The central position of these, relative to the layout as a whole, is another advantage of the plan. Trains can be made up and start from "*Shipley*" if required, and the sidings are also sufficiently convenient in relation to "*Bradford*."

The choice of routes afforded and the operating possibilities of the system make it suitable for use in connection with a guessing contest, that will help to keep your friends entertained at Christmas-time. A clockwork engine can be wound up and started off on a run, guesses being made as to the exact point on the track at which it will stop. As the amount of winding up can be varied, the load altered and the route changed, plenty of fun and excitement can be expected.



A stopping train leaving an intermediate station on a Hornby L.M.S. layout. Similar arrangements would be suitable for the passing station in the diagram.

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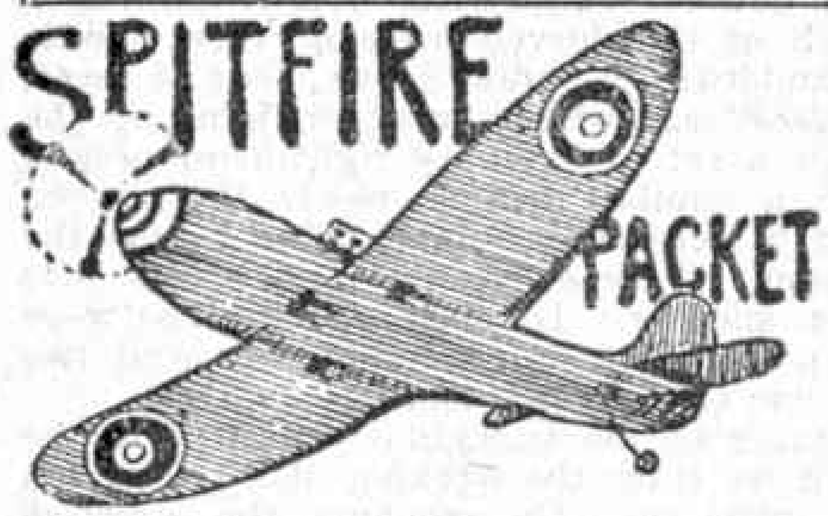

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For other Stamp Advertisements see also pages 432 and viii.

Stamp Collecting

The Mutiny of the "*Bounty*" on Stamps

By F. Riley, B.Sc.

IN our Empire tour let us jump this month from the Solomon Islands, our last place of call, to the Eastern Pacific Ocean, where there is a lonely outpost that has had a very strange history and has recently entered the stamp world. This is Pitcairn Island, famous as the home of the mutineers of the "*Bounty*." The island is only three miles long and about two miles wide, and when first seen by Europeans was uninhabited, although queer statues and skeletons with shells under their heads were there to prove that it had been the home of human beings in the past.

The discovery of Pitcairn Island was made in 1767, and it was named after a midshipman in the vessel from which it was sighted, because he was the first to see it from the masthead. It was next heard of in 1808, when an American vessel discovered there a colony founded by some of the men who took part in the famous "*Bounty*" mutiny. The actual mutiny had taken place almost 20 years earlier. The "*Bounty*" was under the command of Captain Bligh, a capable officer who had accompanied Captain Cook on one of his famous voyages of discovery in the Pacific Ocean. In the "*Bounty*" Bligh was sent in 1767 to collect bread fruit trees in the South Pacific and to take them to the West Indies, where it was hoped they would grow and furnish the inhabitants with valuable food. For a time the vessel stayed at Tahiti, and after leaving there trouble broke out, due partly to the stern rule of Bligh, who was a very strict disciplinarian, and partly also to the fact that the men had enjoyed a very easy life at Tahiti and were eager to taste once more the joys of this, or of a similar existence.

What happened is now well known to all from the famous film "*The Mutiny of the Bounty*." Bligh and a few loyal members of his crew were turned adrift in an open boat in which they finally reached Batavia, 4 000 miles away, after a long voyage during which conditions became very desperate indeed. In the meantime the mutineers had returned to Tahiti, where some of them went ashore. Of these men six were afterwards tried and condemned to death, and three were hanged.

The story of Pitcairn Island concerns the men who did not land at Tahiti. Along with some natives they sailed away, and eventually settled on the island under their leader Fletcher Christian. The healthy climate and abundant rainfall of the island should have provided them with the paradise for which they were looking. Drunkenness lead to quarrels and murder, however, and within 10 years of landing all the original mutineers were dead except Alexander Smith, who in the meantime had taken the name of John Adams. He was greatly changed from the fierce mutineer that he must have been earlier, and he assumed full charge of the little community that had grown up around the original party.

The number of people on this lovely island has grown, and in 1938 there were only 210. There is little or no need for letters among themselves, and their contacts with the outside world are too restricted to suggest that they would need many stamps. For postal services they had to be content for many years with the efforts of the captains of ships calling at the Island, but in 1926 an official sub-post office was established on the island by the New Zealand authorities. The stamps used were those of New Zealand, postmarked with the name of the Island.

It might have been thought that these arrangements would be sufficient for the postal needs of the few islanders, but eventually it was decided that Pitcairn should have its own stamps. There were two reasons for this. One was that many passengers in vessels calling there put mail ashore for posting, chiefly to obtain souvenirs and to provide material for stamp collectors. It was also realised that the stamps themselves would provide valuable revenue for the colony. So there came into existence the set of eight issued in 1940, five of which are illustrated on this page.

It was only natural that the first stamp issue of Pitcairn Island, the only one that has yet appeared, should tell in part the story of the famous mutiny, for the opportunity to provide pictorials of a very attractive kind was too good to be missed. And so we find that of the eight values six are directly concerned with this event. Of the other two, one bears a map of the Pacific Ocean, to show the position of the island, and the other illustrates its fertility by a cluster of oranges, which grow freely there.

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Barbados ..	9	18	Cochin	12	30
Basutoland ..	5	9	Cook Isles ..	5	9
Bechuanaland ..	5	10	Cyprus	10	16
Bermuda	7	12	Dominica ..	6	12
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For other Stamp Advertisements see also pages 430 and viii.

Stamp Gossip

and Notes on New Issues

By F. E. Metcalfe

A STAMP magazine recently commented very ungraciously on the fact that New Zealand had used the Peter Pan statue in Kensington Gardens and Sefton Park, Liverpool, as the central motif in their Health stamps for this year. Well, not only would we all say how welcome these are, but also that few things could have been more appropriate, as can be seen from our illustration.

These annual Health stamps are becoming more popular every year, and so many are sold nowadays that besides stamp collectors the general public apparently must buy and put away thousands of pairs, for surely all cannot be bought by philatelists. The first pair to be issued appeared in 1931, and these sell at about £3 to-day, but it is hardly likely that any of the later issues will ever bring such a high figure, though those of the years 1932, 1933 and 1934 are quite desirable property. Whilst on the subject of the Health stamps, we may as well give our monthly tip, for it has to do with the pair issued in 1942. Some are being offered in a current price list at 10d. They are cheap at double the price.

Dealers have been very perturbed about getting supplies of the Burma stamps overprinted for the use of the Military administration after the eviction of the Japanese. One of these stamps is illustrated this month. A few sets have trickled through, and dealers' offers have appeared, more on the strength of what they hoped to get rather than actual stocks. But when the India Office in London received the long awaited stamps to fill dealers' requirements, it was found that the 3a. and 10r. values were in very short supply. So many more collectors are likely to have to be content with an incomplete set than a full one. At the time this is written, one of each value—there are 15 in all—can be obtained at something under £3. They look very cheap at the price.

Just before Hong Kong fell to the Japanese in 1941, a new value, 8 cents, was issued for use in this colony. As not many were about, a mint copy became worth five shillings, and up to £2 was paid for one genuinely postally used. In the U.S.A. prices for mint were higher still but, alas for those who paid these prices, the stamp has been reissued. Though not many have yet reached England from Hong Kong itself, the price has nevertheless slumped badly. It's all the luck of the game. Stamp collectors can't win every time, not even if they collect only British Colonial stamps; yet in the long run their gains greatly exceed their losses.

As has been foretold, the beautiful issues of the European countries are pouring into Great Britain. As prices are now reasonable, and not likely to fall much with the possible exception of some from France and Germany, dealers are finding a ready trade, for apart from their beauty they are something fresh. Some dealers are complaining that collectors are now neglecting current colonials for the new foreign stamps. If this is correct it's a great pity, for those collectors, if they spend substantial sums, may regret it later.

There is a moral in this. In the first place, it will be admitted by all British people that it is a good thing for us if collectors spend their cash on our own stamps; yet there are those who are agitating for colonial stamps to revert to the old key type, and the abandonment of pictorial issues. Well, if even the present picturesque stamps will hardly retain collectors' affections against these really wonderfully produced stamps of New Europe, what chance is there for the old dry-as-dust designs, which really became out of date at the turn of the last century.

As many of our colonies depend for a substantial percentage of their revenue on the sale of postage stamps to collectors, let us be frank and admit that it is to be hoped that the Colonial Office will think twice before any change is made in the present style of colonial stamps. But how pretty these European stamps are! We are illustrating one this month that speaks for itself.

And now for a contrast. Perhaps the country that is turning out the shoddiest stamps at the present moment is Argentina. Many readers will know those classical "Rivadavias" which were issued in Argentina in 1864. It is just 100 years since the man who inspired those grand old stamps died, and to commemorate his death three stamps have been issued in Buenos Aires. We are illustrating the top value, and a moderate piece of work it is. Surely Bernadino Rivadavia deserved something a bit better than that, for he was Argentina's first President.

Our last illustration bears the portrait of a man whose name will go down to posterity as representing something odious . . . . Quisling.

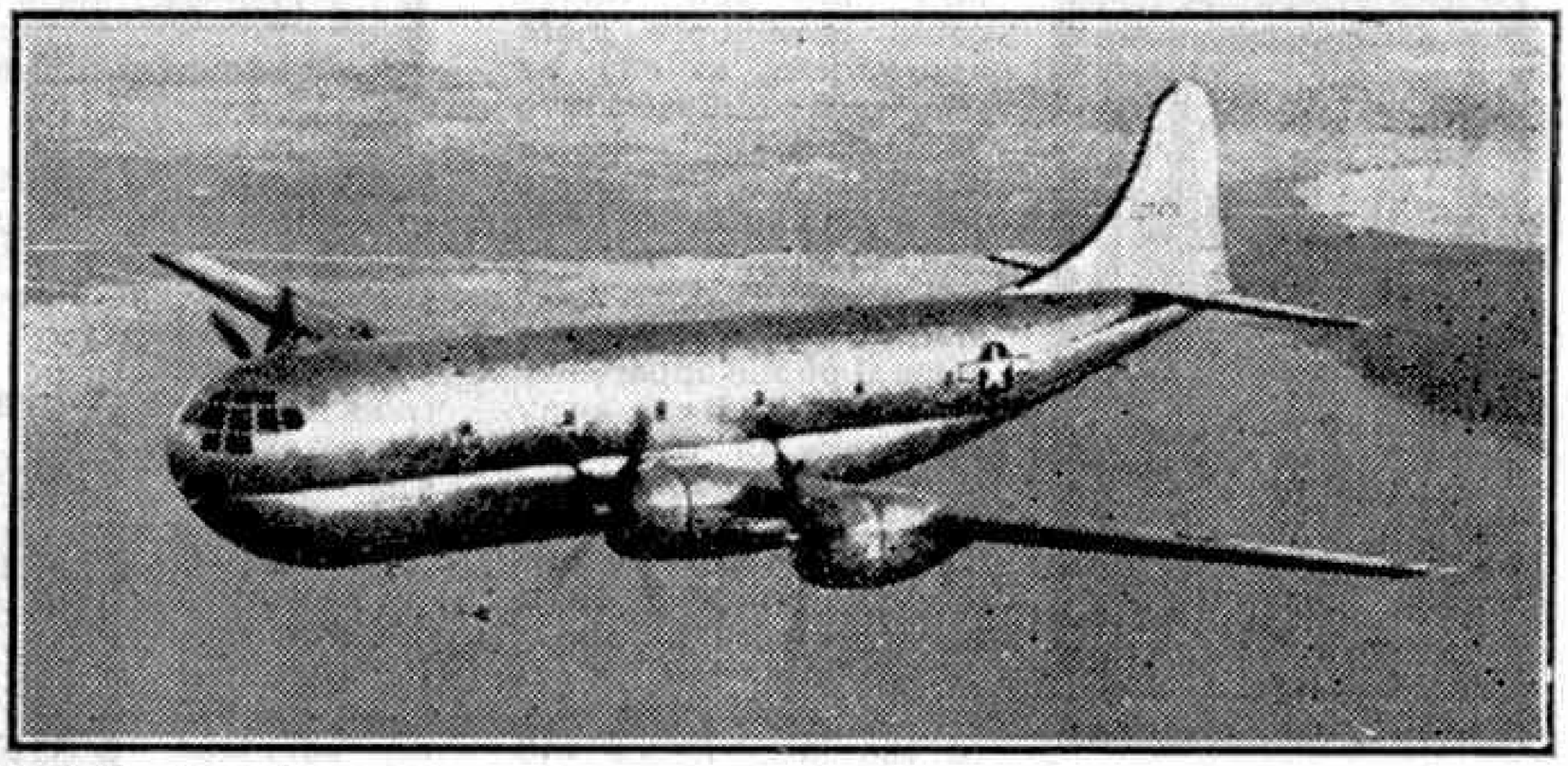
The British Civil Air Fleet—

(*Continued from page 404*)

and should do much to establish British prestige on the Atlantic run. But it will be superseded later by the "Tudor" II which has a much larger fuselage, with accommodation for twice as many passengers.

The "Hermes" is very similar in general layout to the "Tudor" and is approximately the same size; with a wing span of 113 ft. and a loaded weight of 31 tons. It can be fitted out with bunks for 16 "sleeper" passengers, comfortable armchairs for 34 day passengers, or up to 50 smaller seats. There is no doubt that it will carry on the fine tradition of the old Handley Page "Hannibal" biplane, whose remarkable safety record and luxurious accommodation won for Imperial Airways each year more passengers in and out of this country than all other European airlines put together. But whereas the "Hannibals" plodded along at a steady 98 m.p.h. the "Hermes" will cruise at well over double that speed.

All the skill, care and experience that have been put into British warplanes in the last six years will go into the designing and construction of our new airliners, and will ensure that British airlines, the world's first, will once again be the world's best.



The Boeing C-97, shown above, is the transport counterpart of the B-29 "Superfortress" heavy bomber, and is in service with Air Transport Command of the U.S.A.A.F. The civil version of this machine is known as the Model 377 "Stratocruiser." Photograph by courtesy of the Boeing Aircraft Company, U.S.A.

The Atomic Bomb—

(*Cont. from page 413*)

An atomic bomb must have in it at least this critical amount of U235. Such a mass would be very unstable. The release in it of one neutron that penetrated into the nucleus of an atom would start off the chain reaction and the whole mass would explode almost instantaneously. How it was arranged that the atomic bomb used in Japan should explode at exactly the required moment has not been revealed at the time of writing, and this seems to be the greatest secret of the new weapon, for the general behaviour of U235 and the way to extract it from ordinary uranium are well known to scientists.

It is difficult to imagine how much energy goes into the atomic bomb explosion, even when we bear in mind the enormous devastation that the two bombs dropped on Japan caused. We all know what a 10-ton R.A.F. bomb can do, from descriptions and from photographs of bomb damage in German cities, and from this we might be able to form some idea of what would happen if a bomb containing 8,000 tons of ordinary explosive were dropped. Yet the stupendous effect of an ordinary bomb of this size would be no greater than that of an atomic bomb containing only 1 lb. of U235.

There is another way of looking at it that will help us to realise what happens when an atomic bomb explodes. After all, atom splitting is not new, and in fact we ourselves throughout the whole history of life on the Earth have been dependent on atom splitting for warmth, and indirectly for food and clothing. But these atoms are in the interior of the Sun, the warmth and light of which come from continuous atom splitting on a colossal scale that keeps the Sun at a temperature of millions of degrees. Fortunately for us the Sun is a long way off, so far away that the heat and light produced by these atomic explosions are just comforting to us. But when the first atomic bomb exploded over Hiroshima the effect was as if a miniature of the Sun, a ball of matter the temperature of which rose suddenly to 10 million deg. C. or more, with a correspondingly huge rise in pressure, had been suddenly created on Earth. The blinding, blasting effect of this terrific outburst of energy can well be imagined.

So far as is known only one other element could possibly be used in making an atomic bomb, and this does not really exist! The paradox is explained by the fact that the element does not occur in the Earth, but is an artificial one made by smuggling an extra neutron into the atom of uranium by bombardment. Its name is plutonium. Making it is a costly and laborious business, so it seems that only U235 can be used for the present, and this too is rare and extremely costly to isolate. Whether we shall ever learn the secret of splitting the atoms of more common elements, the break up of which keeps the Sun going, remains to be seen.

It seems lamentable that the first real use made of what can only be described as a scientific triumph should be a mission of destruction, and it is hoped that atomic energy will in future find peaceful applications that will be for the benefit of all mankind. Before we can make any approach to this, however, it will be necessary to find some means of harnessing the terrific power that atom splitting can give us by slowing down the process and so robbing the change of its explosive character.

At present the greatest hope of doing this is given by what is known as the uranium pile. In this, uranium mixed with graphite is bombarded by neutrons, with the result that plutonium is formed. If this is hit by neutrons, it will break up, shooting out more neutrons, just as U235 does, but the graphite spreads the materials apart so that the extra neutrons shot out of the plutonium escape instead of spreading the break up through the rest of this element. After a time the bombardment is stopped. The plutonium is then separated from the uranium and is mixed with graphite in a smaller pile that can be used as a source of energy, the graphite being used in sufficient proportion to slow down the chain reaction.

The "Meteor's" Record—(*Continued from page 411*)

world speed record and, consequently, in co-operation with Glosters, started preparing for a record attempt.

The only modifications made to the "Meteor" were the removal of its guns and aerial masts, slight structural strengthening near the control surfaces, the filling in of all holes and the application of a high-gloss surface finish. In addition, longer nacelles were fitted to improve the air supply to the engines.

The rest of the story is now history. Piloted by Group-Capt. H. J. Wilson, the "Meteor" set up a record that will not easily be beaten.

Competitions! Open To All Readers

Find These Hidden Names

Readers of the "*M.M.*" will find more good things advertised in our pages this year than in any December issue for several years. As usual, we are basing our first competition this month on our advertisements.

In the panel on this page there is a square consisting of 81 letters. These have been so arranged that the names of products advertised in this issue of the "*M.M.*" or of the firms advertising them, can be read. The names are traced by starting anywhere and passing at each move to the letter to the left or right, or to that above or below. No diagonal moves must be made, and every letter of the square must be used at least once. There is no restriction on the number of times that a letter can be included, but each letter must be used at least once.

S	N	A	S	T	B	C	N	O
K	I	N	E	R	A	H	O	T
T	V	I	L	C	E	M	U	S
A	W	T	A	C	B	A	C	S
Z	T	I	L	A	S	R	I	E
O	Y	U	D	N	O	B	B	W
L	B	N	R	O	H	A	M	O
N	O	L	L	F	O	N	L	L
D	P	W	I	L	S	Y	E	S

In their solutions competitors must give the names of the product or advertisers concerned, and the number of the pages on which the advertisements appear. Their entries should be addressed "*Advertisement Letter Square, Meccano Magazine, Binns Road, Liverpool 13.*" There will be two sections in the contest, for Home and Overseas readers respectively, and in each prizes of 21/–, 15/– and 10/6 will be awarded, with consolation prizes for other good efforts. The judges will take neatness and novelty into account in making their final decision if there is a tie for any prize.

The closing date in the Home Section is 31st January 1946, and that in the Overseas Section 29th June 1946. Competitors must not omit their names and addresses on their entries.

A Fine Drawing Contest

This month we are continuing our series of Transport Drawing contests. In the previous competitions in the series the subjects have included trains, trams, buses, ships, motor cars and lorries. Now we turn to electric, Diesel and Diesel-electric trains or locomotives, which will give competitors ample scope. They may choose as subjects locomotives and trains of these kinds in any country in the world, so that the huge Diesel and Diesel-electric locomotives now employed in the United States can be included as well as electric trains and locomotives, and Diesel-electric shunting engines in this country.

As usual in these competitions there will be separate competitions for Home and Overseas readers, and in each of these there will be two sections, A for competitors of 16 years of age and over, and B for competitors under 16 years of age. Prizes of 21/–, 15/– and 10/6 will be awarded to competitors in each section whose drawings are considered to be the best, and consolation prizes also will be awarded. Entries should bear the sender's name, full postal address and age on the back, and competitors are particularly requested not to put their names on a separate sheet of paper. Winning entries become the property of Meccano Ltd. Others will be returned if accompanied by a stamped addressed envelope or wrapper.

Envelopes containing entries should be addressed "*December Drawing Contest, Meccano Magazine, Binns Road, Liverpool 13,*" and should be posted to reach us not later than 31st January 1946 in the Home Section and 29th June 1946 in the Overseas Section.

December Photographic Contest

This month's photographic contest is the 12th of our 1945 series, and in it, as usual, prizes are offered for the best photographs of any kind submitted. There are two conditions—1, that the photograph must have been taken by the competitor, and 2, that on the back of the print must be stated exactly what the photograph represents. A fancy title may be added if desired.

Entries will be divided into two sections, A for readers aged 16 and over, and B for those under 16. They should be addressed: "*December Photographic Contest, Meccano Magazine, Binns Road, Liverpool 13.*" There will be separate sections for Overseas readers, and in each section prizes of 15/– and 7/6 will be awarded. Closing dates: Home Section, 31st December; Overseas Section 31st May, 1946.

Fireside Fun

Teacher: "What name is given to a Red Indian's wife?"

Johnny: "She is called a squaw."

Teacher: "Right. Now what is her baby called?"

Johnny: "A squawker, Miss."

* * * * *

"The mistake I made was dropping it."

"No! The mistake you made was picking it up again."

* * * *

"When my father was in Africa he came face to face with a lion, but he never turned a hair."

"Gosh, he must be tough."

"No, he's bald."

* * * *

Inspector: "Now, how many days are there in a year?"

Billy: "Seven, sir."

Inspector: "Rubbish. Now think again."

Billy: "Sunday, Monday, Tuesday, Wednesday, Thursday, Friday and Saturday, sir, an' I don't know any more."

* * * *

"Is killing a pig murder?"

"Of course not. Murder is assaulting with intent to kill. The other is killing with intent to salt."

* * * *

"Was the plaintiff," asked a lawyer, cross examining, "in the habit of talking to himself when alone?"

"I don't know," replied the witness.

"Come, come, you don't know, and yet you pretend that you were intimately acquainted with him?"

"The fact is," said the witness dryly, "I never happened to be with him when he was alone."

* * * *

"Herbert, are you teaching the parrot to use slang?"

"No mamma," replied Herbert. "I was just telling him what not to say."

* * * *

"What becomes of a car when it gets too old to run, Mum?"

"Somebody sells it to your father!"

BRAIN TEASERS

A TRICK CROSSWORD

This looks like half a crossword, but it is really all there. You will find that the clues across, if they had been given, would all have pointed in one direction.

1	2	3	4

The clues down are: 1, stinging insects; 2, idleness; 3, domestic fowls; 4, torment.

* * * *

NUMBER MAGIC

You ask a friend to think of any two numbers from 1 to 9. Then you ask him to double one of them, add five, multiply the result by five, and add the second. He tells you the result is 62. What are the two numbers?"

* * * *

WHAT DID THEY BUY?

Four boys, Dick, John, Harry and Bill, went to a large store one Christmas—it must have been before the war—and there each bought something for himself. One bought a book, one a Meccano Outfit, one a stamp album and one a tie. There were four floors in the building, and each went direct to the floor where the article he wanted was sold.

John did not want a book, and Harry didn't want a toy. Nothing to wear was sold on the 1st floor. Bill never got into the lift and Harry was last out of it.

Toys were sold on the second floor. Dick did not buy a tie and went to the third floor. Bill despised hobbies of all kinds.

Now, who bought what and where?

* * * *

"Yes, the cost of her lessons has been a real investment. I've just been able to buy the house next door at half its value."

* * * *

SOLUTIONS TO LAST MONTH'S PUZZLES

A glance at the calendar should be enough to provide the solution to our first puzzle last month, for it will show that a month with five Tuesdays, but only four Mondays, must begin on a Tuesday. So 1st July is a Tuesday, and 1st August must be a Friday. The third Monday in August is then the 18th. The second half of this problem is the first reversed, and the answer is four Mondays and five Tuesdays.

The minute hand of a watch crosses the hour hand for the first time after noon at five and five-elevenths minutes past one. The time between successive crossings is one hour, five and five-elevenths minutes, so that in a day of 24 hrs. there are 22 crossings.

In our third problem there are nine ways of doing the wrong thing.

Finally, the required names of seven Presidents of the United States are Lincoln, Harrison, Jefferson, Jackson, Cleveland, Garfield and Washington.

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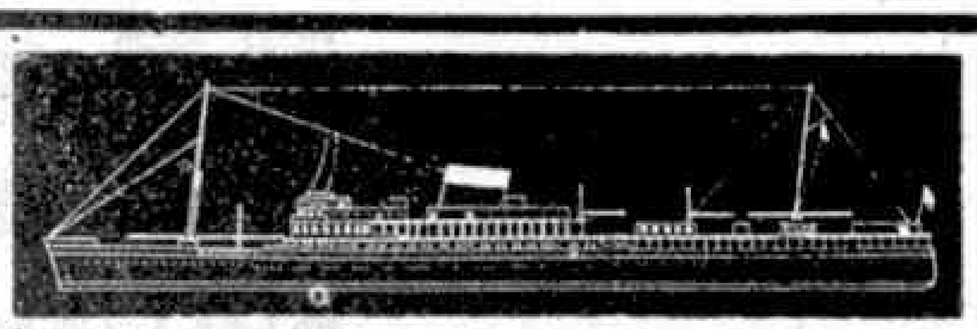

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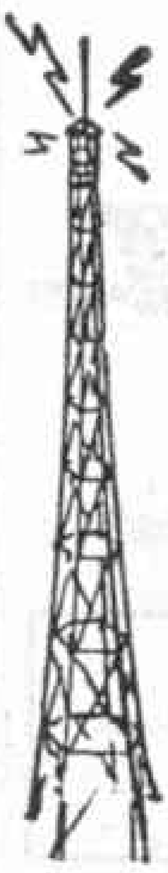

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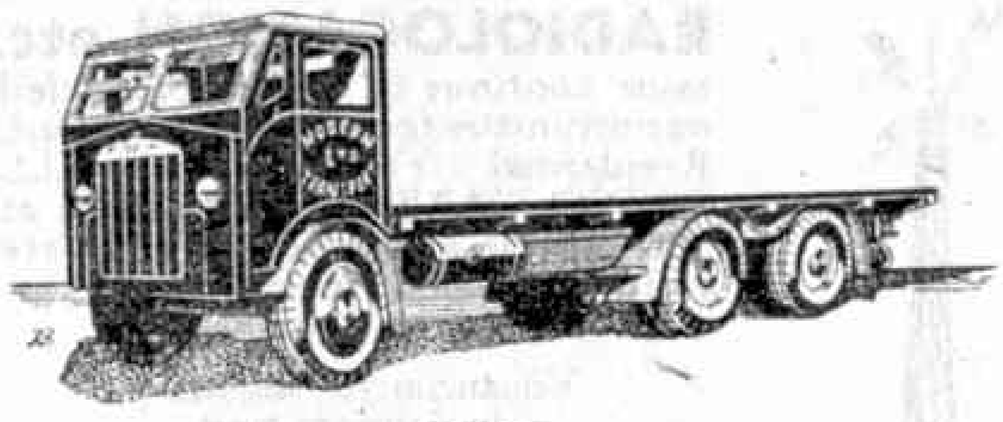

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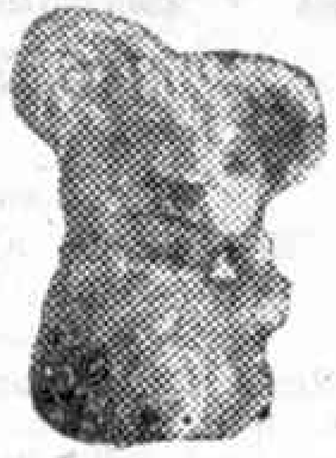

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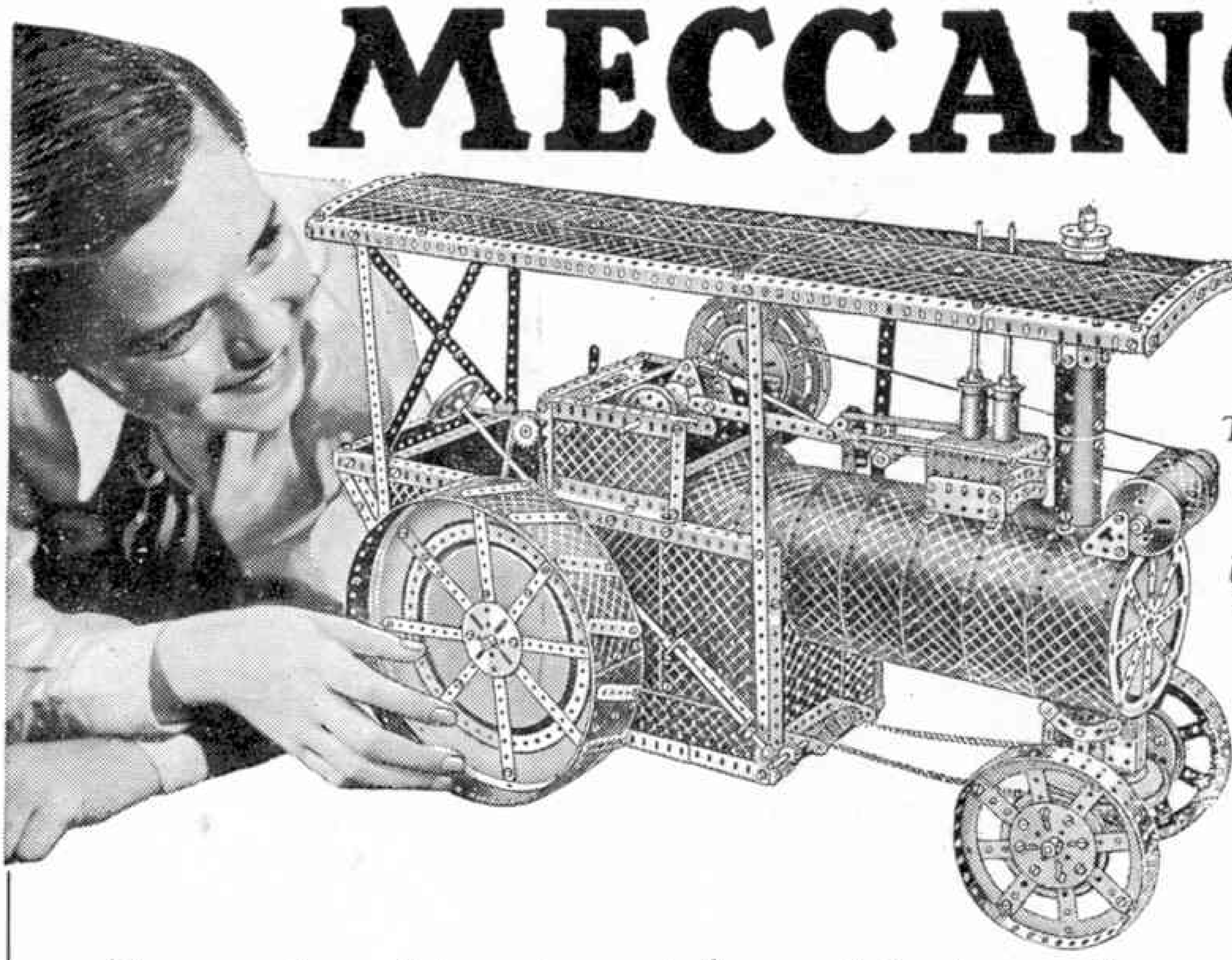

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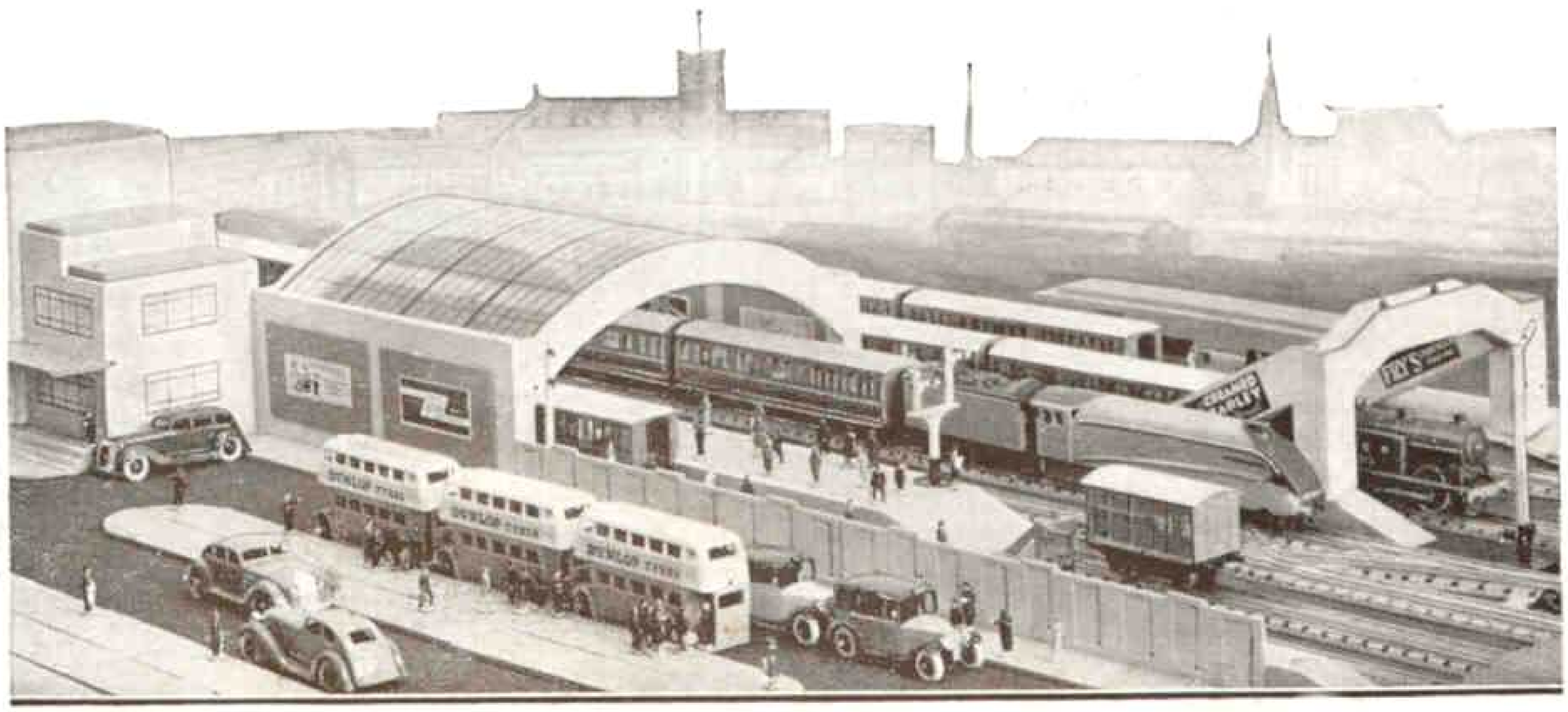

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